

RIO Remote I/O system

User guide

Part number: 5500036-15

Date: 21 November 2001

Navigating around this manual



Using this on-line manual. See page 5.



Fast Contents. See page 7.



Contents. See page 8.



Quick Reference. See page 211.



Index. See page 310.

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Warning: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Caution: The products described in this manual are approved for commercial use only.



About this manual

Purpose of this manual

This manual tells you how to install, configure and use the Perle RIO system hardware, associated drivers and utility software.

Who this manual is for

This manual is aimed at users who want to connect peripherals and terminals to a host either in the same site or remotely using the Perle RIO serial connectivity system. This manual requires a working knowledge of using personal computers and associated operating systems, as well as experience in installing host cards and peripherals.



Warning

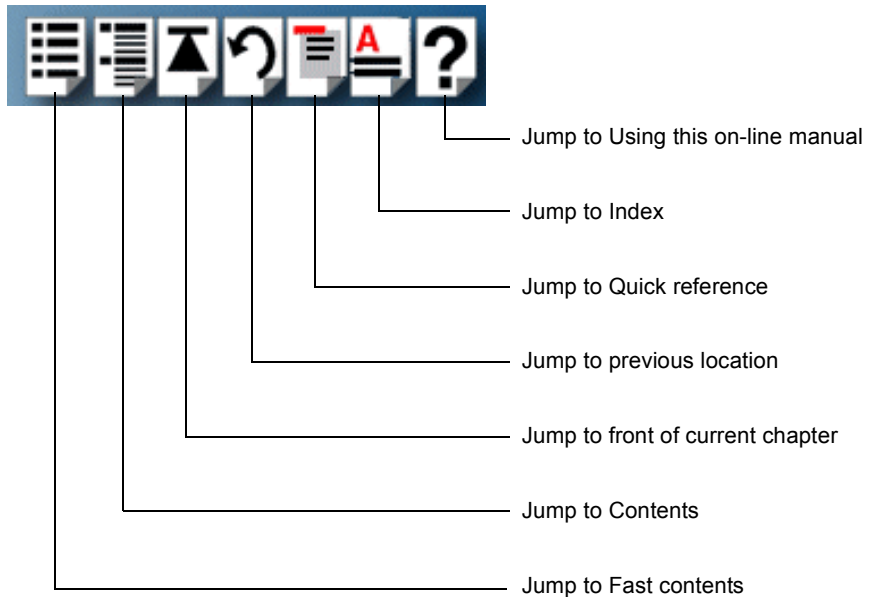
Dangerous voltages exist inside computer systems. Before installing host cards in your system, turn off the power supply and disconnect the mains lead.

Using this on-line manual

The following is a brief guide to using this manual on-line.

Document navigation

This manual features document navigation hypertext buttons in the header area as shown in the next picture;



Hypertext jumps

You can also navigate around this manual by clicking on any cross reference or text in blue for example, [Hypertext jumps](#).

Note

The **Fast Contents**, **Contents** and **Index** entries are all hypertext jumps into this manual.

Revision history

Date	Part number	Description
January 1999	5500036-10	First issue of new RIO user manual for the Solaris operating system.
January 2000	5500036-11	Update of manual to include the Windows 2000 and Linux operating systems.
March 2000	5500036-12	Update of manual to include the Windows NT operating system.
March 2000	5500036-13	Update of manual to include the SCO OpenServer 5 operating system.
April 2000	5500036-14	Update of manual to include the SCO UnixWare operating system.
November 2001	5500036-15	Update of manual for rebranding.

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Chapter 1 Introduction

You need to read this chapter if you want to...

You need to read this chapter if you want an introduction to the Perle RIO serial connectivity system.

This chapter provides introductory information about the Perle RIO serial connectivity system, its associated components, driver software and configuration utilities.

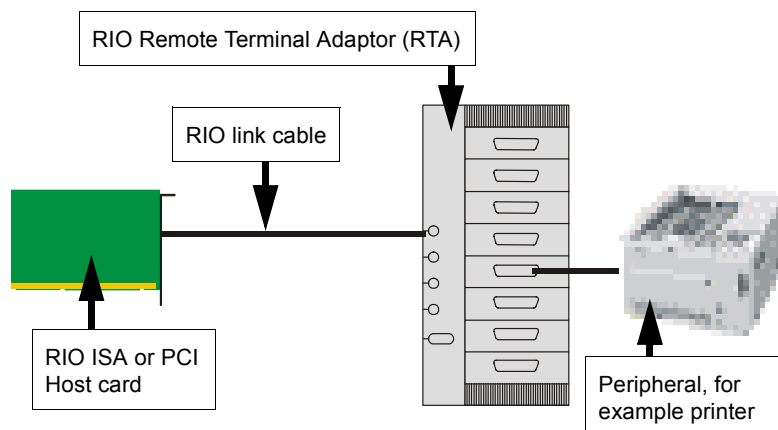
This chapter includes the following sections;

- [About the RIO system](#) on page **20**
- [RIO system components](#) on page **21**
- [Example RIO systems](#) on page **24**

About the RIO system

RIO is a high throughput serial connectivity system which provides up to 128 serial devices via a single server slot. You can expand a RIO system up to 512 ports per server. RIO allows you to add ports using 8 and 16 port modules which can be supplied with a wide range of serial interfaces. The RIO system has fault tolerant capabilities, and allows long distance connection without signal degradation or performance loss.

A typical RIO system is shown in the next picture. For details of the main RIO system components, see [RIO system components](#) on page 21.



You use RIO when you need a system which supports fault tolerant cabling. The RIO system allows you to add and remove port modules while the system is "live", which means you can reconfigure without interrupting operations. The relocated units retain their original port names and settings. This capability is especially useful in the case of cable disruption, and also for situations where complete data security is required. In addition, RIO supports the connection of a stand-by host in case of server crashes.

You also use RIO because you require a system that allows long distance connection without signal degradation or performance loss. RIO allows you to install port modules up to 75 metres from the host card using twisted pair cabling. Furthermore you can extend the range by daisy chaining devices. In addition, you can connect port modules up to 1Km from the host via copper wire or fibre optic, or longer distances via leased line, using RIO connectivity modules.

You use RIO where you need a system that you can reconfigure live without interrupting system operation. This capability is typically used in environments such as manufacturing plants, test suites and hospitals.

RIO system components

This section provides a brief description of the main components of the RIO system and includes the following.

- [Host card](#) on page [21](#)
- [Link cables](#) on page [21](#)
- [Remote Terminal Adaptors](#) on page [22](#)
- [Long Distance Module \(LDM\)](#) on page [22](#)
- [Fibre optic \(FOLK\) kit](#) on page [23](#).

Host card

RIO host cards provide system connection to Remote Terminal Adaptors (RTAs). They have four link ports and are available in ISA and PCI formats. See also [Installing a PCI host card](#) on page [142](#), [Installing an ISA host card](#) on page [143](#) and [Removing host cards](#) on page [145](#) in [Chapter 2 Installing hardware and software](#).

Link cables

Link cables allow you to link host cards to Remote Terminal Adaptors (RTAs). See also [Link Cable](#) on page [204](#) in [Chapter 3 RIO Cabling information](#).

Remote Terminal Adaptors

Remote Terminal Adaptors (RTAs) are basically serial connection blocks which provide a number of ports depending on type. RTAs come in three main varieties, the RTA 8 (providing 8 ports) and RTA 16 and RRC16 (providing 16 ports). Each unit is available in a number of variations as shown in the next table.

RTA type	Number of ports	Type	For details of installation see...
Currently available products			
RRC16/RJX	16	High speed RS232 asynchronous RJ45 serial ports with ESD protection	RRC16 Remote Concentrator on page 153 RTA8 8 port Remote Terminal Adaptors on page 147
RTA8RJX	8	RS232 RJ45 with ESD protection	
RTA8/RJ	8	RS232 RJ45	
RTA8/DX	8	RS232 DB25 Female/ESD Protected	
RTA8/D	8	RS232 DB25 Female	
RTA8/MX*	8	RS232 DB25 Male/ESD Protected	
RTA8/M	8	RS232 DB25 Male	
RTA8/PX*	8	Comprising 1 Centronics Parallel DB25, 7 RS232 DB25 Female/ESD Protected	
RTA8/P	8	Comprising 1 Centronics Parallel DB25, 7 RS232 DB25 Female	
RTA8/422	8	RS422 DB25 Female	
Older products			
RTA16/DX	16	RS232 DB25 with ESD protection	RTA16 16 port Remote Terminal Adaptors on page 150
RTA16/D	16	RS232 DB25 Female	

See also [Installing Remote Terminal Adaptors \(RTAs\)](#) on page [146](#) in [Chapter 2 Installing hardware and software](#).

Long Distance Module (LDM)

The RIO Long Distance Module (LDM) allows you to extend your RIO system via a leased line. Using a RIO Long Distance Module you can make connections over thousands of miles using synchronous (X.21/X.21bis) or asynchronous interfaces. The long distance module comprises two long distance units (LDUs). One is installed at the host site and the other at the remote site. See also [Installing a Long Distance Module \(LDM\)](#) on page [162](#) in [Chapter 2 Installing hardware and software](#).

Fibre optic (FOLK) kit

The RIO fibre optic (FOLK) kit allows you to extend the range of a RIO link via fibre optic cable to a distance of up to one kilometre. The kit comprises two fibre optic modules. Each module consists of a 1metre long RIO link cable connected to a fibre optic converter. The fibre optic cable plugs into one of these converters at each end. See also [Installing a Fibre Optic Link Kit \(FOLK\)](#) on page 160 in [Chapter 2 Installing hardware and software](#).

Example RIO systems

This section provides typical examples of the main RIO system types.

Note

The Remote Terminal Adaptors shown in the following examples are 8 port RTA8s. For details of the different types of RTAs available see [Remote Terminal Adaptors](#) on page 22.

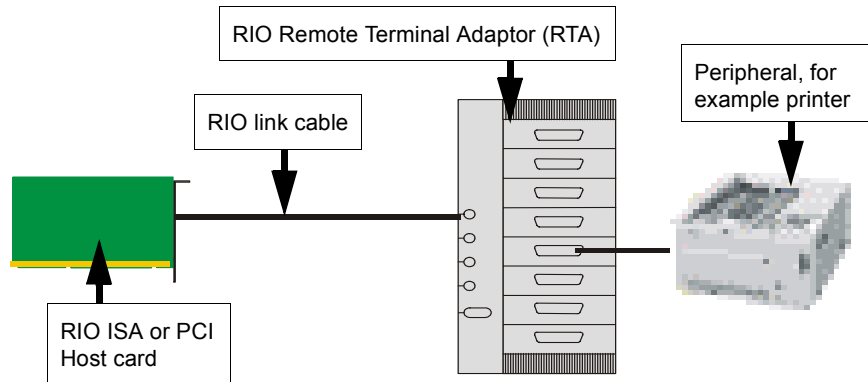
The example systems described are as follows;

- [Short distance link using RIO link cable](#) on page 25
- [Medium distance link using fibre optic \(FOLK\) kit](#) on page 26
- [Long distance link via leased line](#) on page 27
- [Fault tolerant link](#) on page 28
- [Dual host fail-safe link](#) on page 29.

To install any of these, first refer to [Before you start](#) on page 31 in [Chapter 2 Installing hardware and software](#) in this manual.

Short distance link using RIO link cable

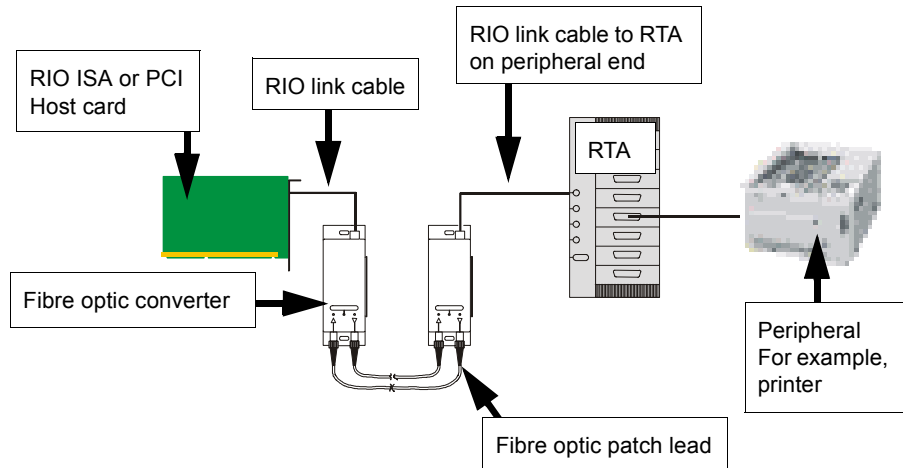
For short distances up to 75 metres you can use the RIO link cable to make up a basic RIO system as shown in the next picture. Typically, you use this type of system when you want to connect peripherals to the host within the same building.



See also [Before you start](#) on page 31 and [Installing a short distance link](#) on page 159 in [Chapter 2 Installing hardware and software](#).

Medium distance link using fibre optic (FOLK) kit

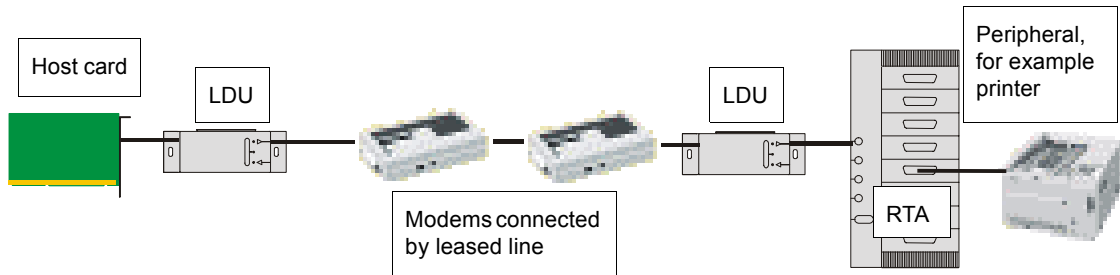
The RIO fibre optic (FOLK) kit allows you to extend the range of a RIO link via fibre optic cable to a distance of up to one kilometre. The kit comprises two fibre optic modules. (A module is shown on [page 160](#)). Each module consists of a 1 metre long RIO link cable connected to a fibre optic converter. This converts the transputer signals into light. The fibre optic cable plugs into one of these converters at each end.



See also [Before you start](#) on page 31 and [Installing a Fibre Optic Link Kit \(FOLK\)](#) on page 160 in [Chapter 2 Installing hardware and software](#).

Long distance link via leased line

The RIO Long Distance Module (LDM) allows you to extend your RIO system via a leased line. Using a RIO Long Distance Module you can make connections over thousands of miles using synchronous (X.21/X.21bis) or asynchronous interfaces. A typical remote system is shown in the next picture.

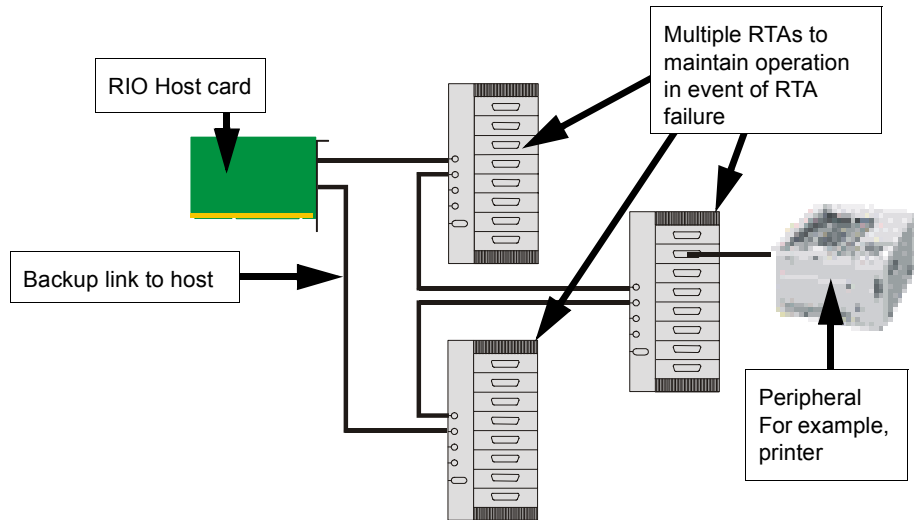


For further details about this type of system see [Before you start](#) on page 31 and [Installing a Long Distance Module \(LDM\)](#) on page 162 in [Chapter 2 Installing hardware and software](#).

Fault tolerant link

In a typical non fault tolerant RIO system, a host card is connected to a peripheral (for example, a printer) via a single link and RTA. In order to make the system fault tolerant, that is to protect against RTA or link failure, multiple RTAs and links are added.

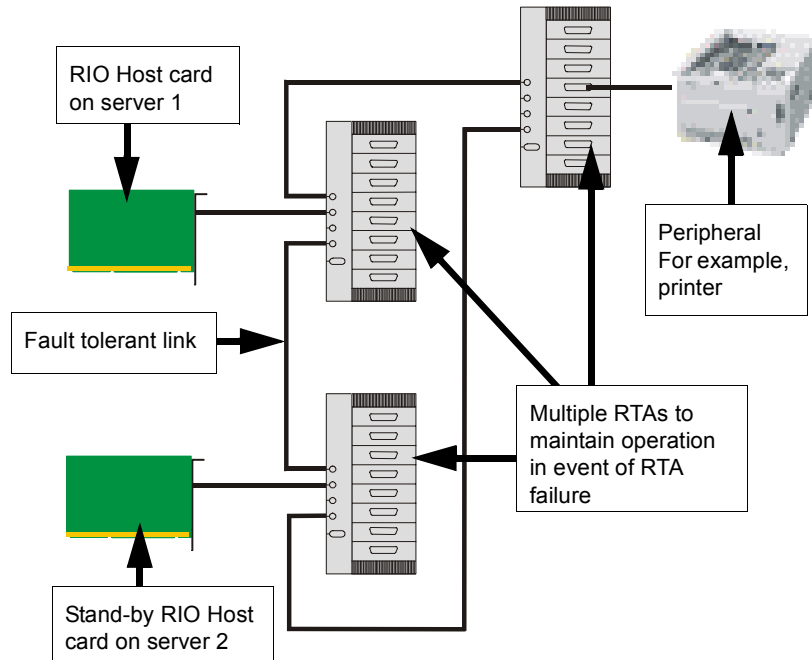
The next picture shows a typical system which features two backup RTAs and a backup link to the host. If one RTA or link cable is damaged there is still a path from the host and system operation is not disrupted.



For further information about installing a fault tolerant system, see [Before you start](#) on page 31 and [Installing a fault tolerant link](#) on page 174 in [Chapter 2 Installing hardware and software](#).

Dual host fail-safe link

The RIO system supports the connection of a stand-by host in case of server crashes. A typical example is shown in the next picture. In this system a second stand-by host has been added which is installed in a separate server, thus if one host fails, system operation is still maintained. Note that a fault tolerant link is often added between RTAs for additional protection of the system.



For information on how to install a dual host fail-safe system, see [Before you start](#) on page 31 and [Installing a fault tolerant link](#) on page 174 in [Chapter 2 Installing hardware and software](#).

Chapter 2 Installing hardware and software

You need to read this chapter if you want to...

You need to read this chapter if you want to install a RIO system and associated software. This chapter covers installing and configuring RIO hardware and software.

Note

The procedure for installing and configuring RIO serial adaptor cards varies for different operating systems. Please read [Before you start](#) on page 31 before installation.

This chapter includes the following sections;

- [Before you start](#) on page 31
- [Downloading RIO drivers from the Perle web site](#) on page 32
- [Installing RIO under Solaris](#) on page 33
- [Installing RIO under SCO OpenServer 5](#) on page 50
- [Installing RIO under SCO UnixWare](#) on page 73
- [Installing RIO under Windows NT](#) on page 87
- [Installing RIO under Windows 2000](#) on page 107
- [Installing RIO under Linux](#) on page 129
- [Installing a PCI host card](#) on page 142
- [Installing an ISA host card](#) on page 143
- [Removing host cards](#) on page 145.
- [Installing Remote Terminal Adaptors \(RTAs\)](#) on page 146
- [Removing a Remote Terminal Adaptor \(RTA\)](#) on page 158
- [Installing a short distance link](#) on page 159
- [Installing a Fibre Optic Link Kit \(FOLK\)](#) on page 160
- [Installing a Long Distance Module \(LDM\)](#) on page 162
- [Installing a fault tolerant link](#) on page 174
- [Installing a dual host fail-safe link \(UNIX only\)](#) on page 175

Before you start

Before you install your RIO host cards and software, note that the procedure for installing and configuring RIO serial adaptor cards varies for different operating systems.

To install under a particular operating system, please refer to one of the operating system specific installation procedures listed below;

- [Installing RIO under Solaris](#) on page [33](#).
- [Installing RIO under SCO OpenServer 5](#) on page [50](#)
- [Installing RIO under SCO UnixWare](#) on page [73](#)
- [Installing RIO under Windows NT](#) on page [87](#)
- [Installing RIO under Windows 2000](#) on page [107](#)
- [Installing RIO under Linux](#) on page [129](#).

Downloading RIO drivers from the Perle web site

You can install the RIO driver and utility software from the Perle web site. To do this proceed as follows;

1. On your PC, start the Internet browser you want to use (for example, Netscape).
2. Within your Internet browser window, select the software directory using the following URL;

<http://www.perle.com/downloads>

Note

In the event of any problems contact your System Administrator or Internet Service provider for assistance.

3. Select the directory you want from the list of operating system directories.
The selected operating system directory is now displayed.
4. Download the files in this directory to a suitable location on your PC for example, **/tmp**.
5. Follow the instructions for installing the software.

Installing RIO under Solaris

This section tells you how to install host cards, software drivers and utilities under the Solaris operating system and includes the following;

- [General setup procedure for Solaris](#) on page [34](#)
- [Upgrading from existing device drivers](#) on page [36](#)
- [Upgrading your current RIO driver](#) on page [36](#)
- [Installing device drivers and utilities](#) on page [37](#)
- [Assigning ISA host card addresses and IRQ levels](#) on page [39](#)
- [Removing RIO drivers and utilities from your system](#) on page [40](#)
- [Setting up terminals using Admintool](#) on page [42](#)
- [Removing RIO serial port terminals](#) on page [47](#)
- [Updating your RIO system configuration](#) on page [49](#).

Note

This version of RIO supports versions 2.6 and 7 of the Solaris operating system.

General setup procedure for Solaris

The general procedure for installing RIO for the Solaris operating system is as follows:

1. If required, install any PCI host cards you require into your system. See [Installing a PCI host card](#) on page [142](#)
2. Install the RIO Solaris drivers and utilities onto your system using the procedures described in [Installing device drivers and utilities](#) on page [37](#).
3. If required, using the **rioisacfg** utility, select and assign addresses for any additional ISA host cards you want to install from the free addresses available. See [Assigning ISA host card addresses and IRQ levels](#) on page [39](#).
4. If required, install any ISA host cards you require into your system. See [Installing an ISA host card](#) on page [143](#)
5. If you want to remove any ISA host cards from your system,
 - a. at the command prompt, type:
`/etc/rioisacfg [-d <name>]` and press the **Enter** key
 where **<name>** is the host card name (for example, ISA1) and **d** is the delete command.
 - b. Now physically remove any host cards you want from your system using the procedures described in [Removing host cards](#) on page [145](#).
6. Install the links you require in your system using one of the procedures shown in the next table;

Link type	For procedure see...
Short distance	Installing a short distance link on page 159
Medium distance	Installing a Fibre Optic Link Kit (FOLK) on page 160
Long distance	Installing a Long Distance Module (LDM) on page 162
Fault tolerant	Installing a fault tolerant link on page 174
Dual host fail-safe	Installing a dual host fail-safe link (UNIX only) on page 175

7. Install the Remote Terminal Adaptors you require for your system. see [Installing Remote Terminal Adaptors \(RTAs\)](#) on page [146](#).
8. If required, remove any Remote Terminal Adaptors you want from your system. See [Removing a Remote Terminal Adaptor \(RTA\)](#) on page [158](#).
9. Set up any terminals attached to your system using Admintool. See [Setting up terminals using Admintool](#) on page [42](#).
10. If required remove any terminals from your system using Admintool. See [Removing RIO serial port terminals](#) on page [47](#).

11. If you have made any changes to an existing RIO system, run the **rioconfig** utility to update your system with the new configuration. See [Updating your RIO system configuration](#) on page 49.

Your system is now ready for use. If required, you can reconfigure the system following initial installation. See [page 39](#) and [page 42](#) for details.

Upgrading from existing device drivers

If your system already has an existing Perle device driver up to version 1.1.0 installed, you cannot install a new device driver unless you follow the correct upgrade procedure. The procedure required is as follows;

1. Remove the existing device driver using the procedure described in [Removing RIO drivers and utilities from your system](#) on page 40.
2. Install the new device driver using the procedures described in [Installing device drivers and utilities](#) on page 37.
3. Continue with your installation as required using the steps listed under [General setup procedure for Solaris](#) on page 34.

Upgrading your current RIO driver

To upgrade your current RIO device driver, proceed as follows;

1. Follow the procedure for installing device drivers detailed in [Installing device drivers and utilities](#) on page 37 using the upgrade options when prompted by the software.
2. Now follow the steps described in one of the procedures listed in the next table depending on your operating system to complete the installation process.

Operating system	See procedure ...
Solaris	Installing device drivers and utilities on page 37.

Installing device drivers and utilities

To install the RIO device drivers and utilities for the Solaris operating system proceed as follows;

Note

Before you install the RIO drivers and utilities you need to obtain the driver package file ("riosol.pkg").

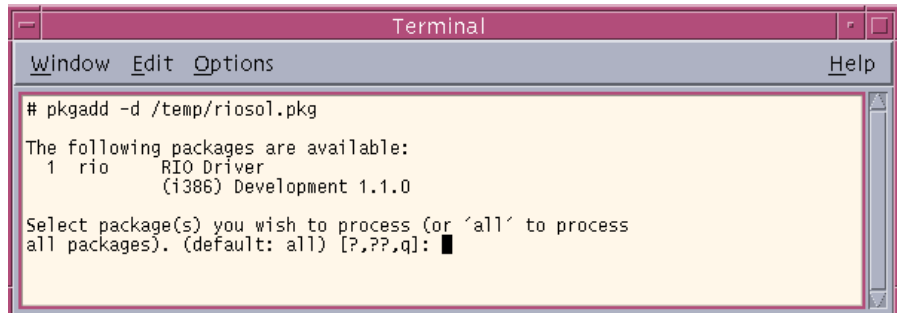
You can do this from either the CDROM (Solaris will automatically mount the CDROM when inserted, and start the file manager application), or our website (see [Downloading RIO drivers from the Perle web site](#) on page 32).

1. Login to your system as super user and begin a terminal session.
2. At the command prompt, type one of the commands shown in the next table depending on the source of the riosol.pkg file you want to use;

Source of riosol.pkg file	Type this command
CDROM Note x is version number	pkgadd -d /cdrom/drivers/rio/solaris/riosol.pkg

3. Press the **Enter** key.

The following question is now displayed:



```

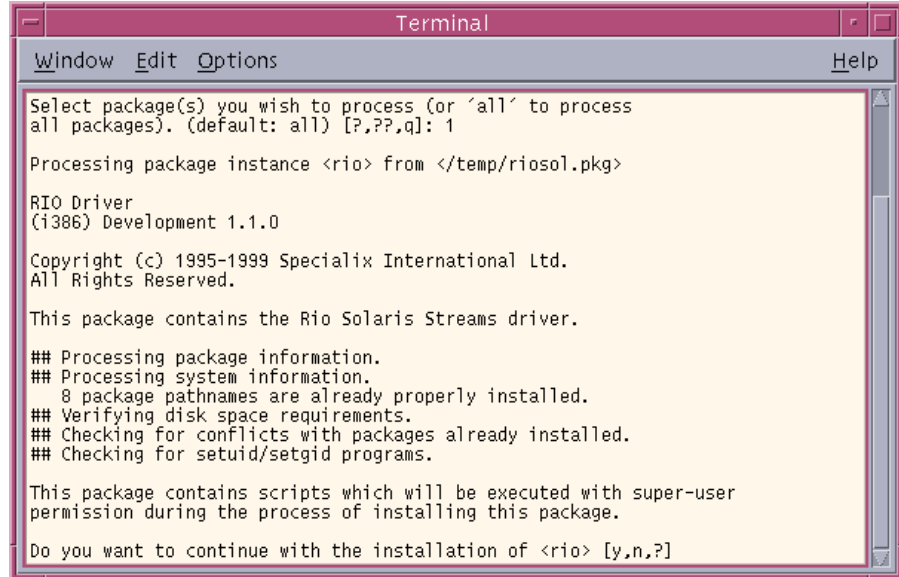
Terminal
Window Edit Options Help
# pkgadd -d /temp/riosol.pkg

The following packages are available:
 1  rio      RIO Driver
    (i386) Development 1.1.0

Select package(s) you wish to process (or 'all' to process
all packages). (default: all) [?,??,q]:

```

4. At the question prompt, type **1** and press the **Enter** key.
The following confirmation is now displayed as shown in the next picture.



```
Terminal
Window Edit Options Help

Select package(s) you wish to process (or 'all' to process
all packages). (default: all) [?,??,q]: 1

Processing package instance <rio> from </temp/riosol.pkg>

RIO Driver
(i386) Development 1.1.0

Copyright (c) 1995-1999 Specialix International Ltd.
All Rights Reserved.

This package contains the Rio Solaris Streams driver.

## Processing package information.
## Processing system information.
   8 package pathnames are already properly installed.
## Verifying disk space requirements.
## Checking for conflicts with packages already installed.
## Checking for setuid/setgid programs.

This package contains scripts which will be executed with super-user
permission during the process of installing this package.

Do you want to continue with the installation of <rio> [y,n,?]
```

5. At the question prompt, type **y** and press the **Enter** key.

A series of messages are now displayed ending with a confirmation that installation was successful.

The drivers and utility software is now installed and operational. See [General setup procedure for Solaris](#) on page 34 for instructions on adding ISA host cards, Remote Terminal Adapters and Ports.

Assigning ISA host card addresses and IRQ levels

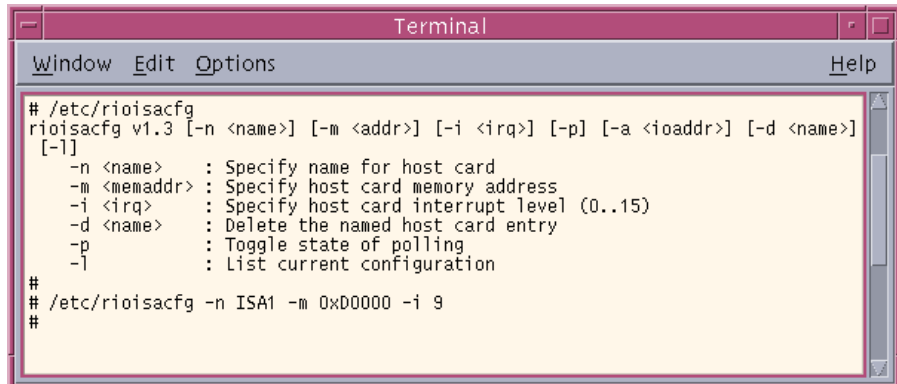
The **rioisacfg** Utility allows you to define addresses and IRQ levels for RIO host cards you add to the system. You run this utility before installing the hardware using the following steps;

1. Decide on the name, memory address and IRQ level you require.

Note

You may need to reserve memory and Interrupt resources for ISA cards using the system BIOS setup or system configuration program.

2. On each host card, set the address you want using the procedures described in [Installing an ISA host card](#) on page 143.
3. At the command prompt, type **/etc/rioisacfg** and press the **Enter** key.
Some help text is now displayed which explains the syntax used by this utility.



```

Terminal
Window Edit Options Help
# /etc/rioisacfg
rioisacfg v1.3 [-n <name>] [-m <addr>] [-i <irq>] [-p] [-a <ioaddr>] [-d <name>]
[-l]
-n <name>      : Specify name for host card
-m <memaddr>   : Specify host card memory address
-i <irq>       : Specify host card interrupt level (0..15)
-d <name>      : Delete the named host card entry
-p            : Toggle state of polling
-l            : List current configuration
#
# /etc/rioisacfg -n ISA1 -m 0xD0000 -i 9
#

```

4. At the command prompt, enter the command to start the **rioisacfg** utility using the card parameters you decided in step 1. as shown in the next example:

/etc/rioisacfg -n ISA1 -m 0xD0000 -i 9

5. Press the **Enter** key.
6. Repeat steps 1. to 5. until you have assigned addresses to all the ISA host cards you want to install.

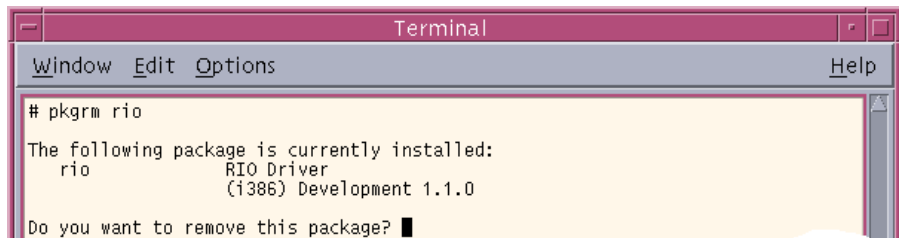
You can now continue with the rest of the procedure required to install the host card. See step 4. in [General setup procedure for Solaris](#) on page 34 for details.

Removing RIO drivers and utilities from your system

To remove the RIO device drivers and utilities for the Solaris operating system, proceed as follows;

1. Login to your system as super user and begin a terminal session.
2. At the command prompt, type **pkgrm rio** and press the **Enter** key.

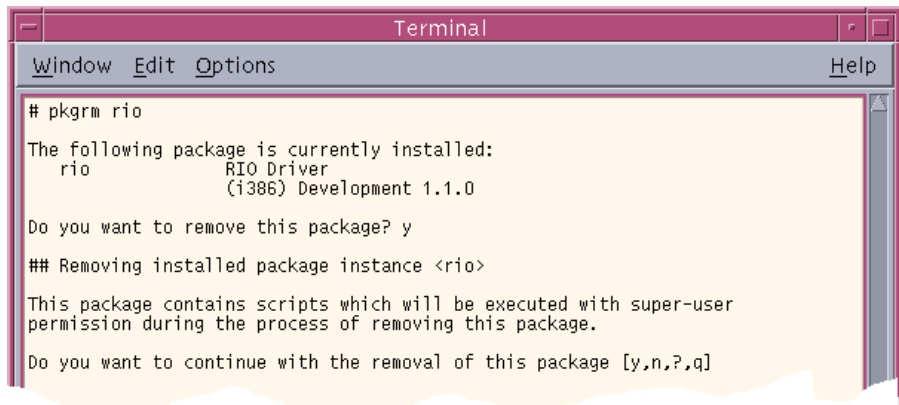
The following question is displayed:



```
Terminal
Window Edit Options Help
# pkgrm rio
The following package is currently installed:
  rio          RIO Driver
               (i386) Development 1.1.0
Do you want to remove this package? █
```

3. At the question prompt, type **y** and press the **Enter** key.

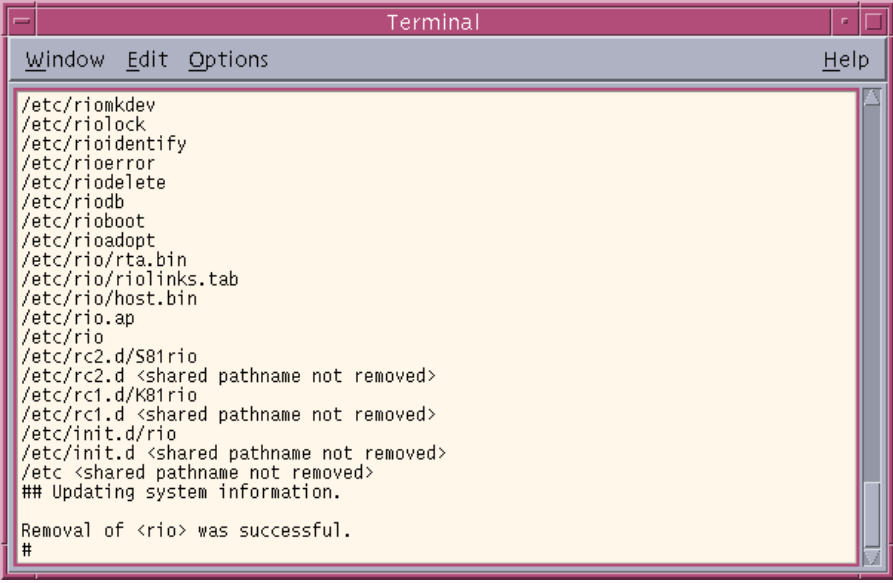
A further confirmation is displayed.



```
Terminal
Window Edit Options Help
# pkgrm rio
The following package is currently installed:
  rio          RIO Driver
               (i386) Development 1.1.0
Do you want to remove this package? y
## Removing installed package instance <rio>
This package contains scripts which will be executed with super-user
permission during the process of removing this package.
Do you want to continue with the removal of this package [y,n,?,q]
```

4. At the question prompt, type **y** and press the **Enter** key to remove the software package.

The messages shown in the next picture are now displayed and RIO driver and utility software removed.



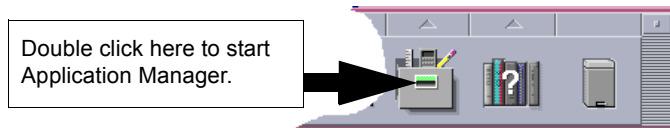
```
/etc/riomkdev
/etc/riolock
/etc/rioidentify
/etc/rioerror
/etc/riodelete
/etc/riodb
/etc/rioboot
/etc/rioadopt
/etc/rio/rta.bin
/etc/rio/riolinks.tab
/etc/rio/host.bin
/etc/rio.ap
/etc/rio
/etc/rc2.d/S81rio
/etc/rc2.d <shared pathname not removed>
/etc/rc1.d/K81rio
/etc/rc1.d <shared pathname not removed>
/etc/init.d/rio
/etc/init.d <shared pathname not removed>
/etc <shared pathname not removed>
## Updating system information.

Removal of <rio> was successful.
#
```

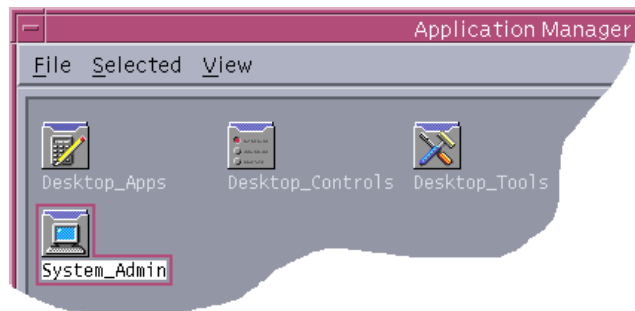
Setting up terminals using Admintool

To configure RIO serial ports added to the system proceed as follows;

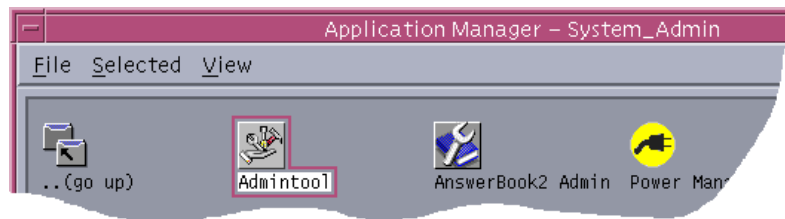
1. In the Solaris desktop, single click on the **Application Manager** toolbar icon shown in the next picture.



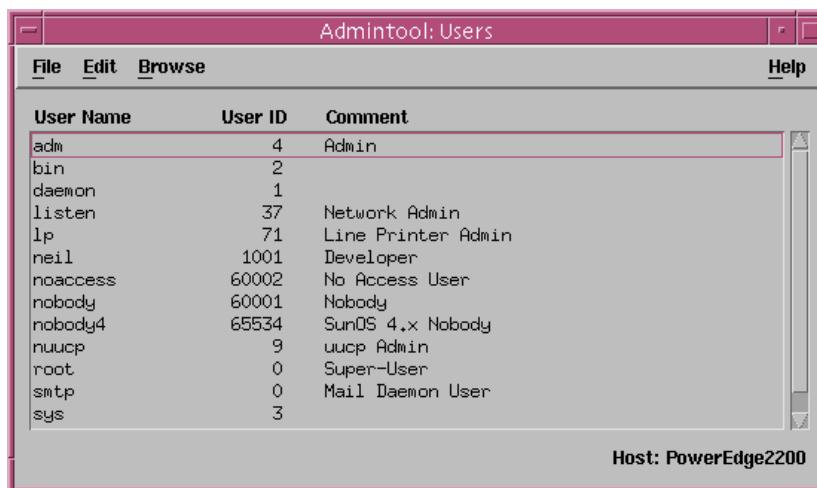
The Application Manager window is now displayed.



2. In the Application Manager window, double click on the **System_Admin** folder.
The System_Admin window is now displayed.

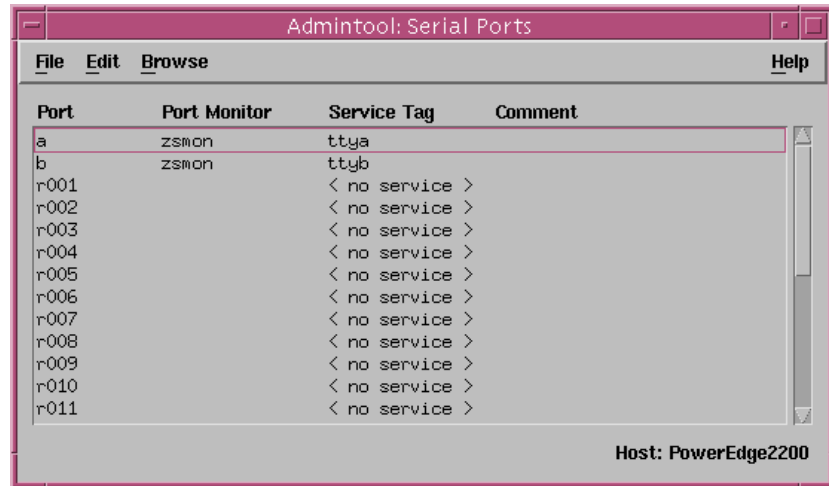


3. In the System_Admin window, double click on the **Admintool** icon.
The main Admintool window is now displayed as shown in the next picture.



4. In the Admintool menu, click on **Browse > Serial Ports**.

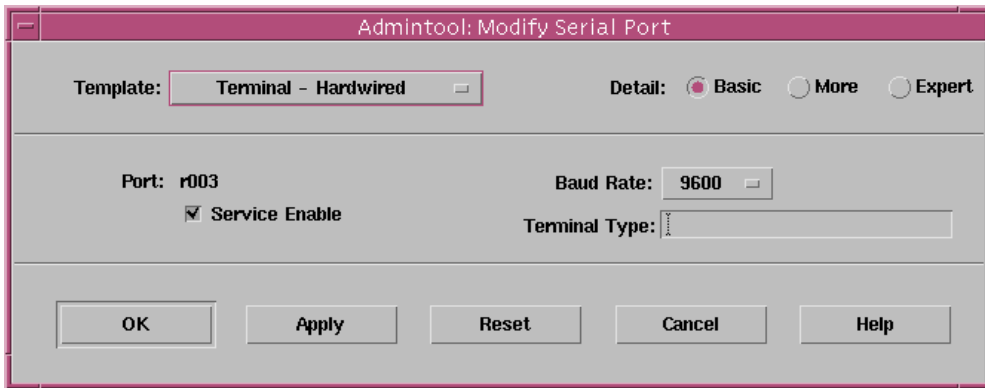
The Serial Ports window is now displayed.



- In the Serial Ports window, double click on the serial port you want to modify. Alternatively, click on the port to highlight it, then in the Serial Ports menu click on **Edit > Modify**.

The Modify Serial Port window is now displayed.

6. In the Modify Serial Port window, display basic information only by clicking on the **Basic** button in the **Detail** field.



7. In the Modify Serial Port window, click on the **Template** selector and choose the type of device you want to connect to the currently selected serial port. For example, to attach a terminal to the serial port, select **Terminal-Hardwired**.

Hint

For details of the parameters in this field click on the help button to invoke the Solaris on-line help about this window.

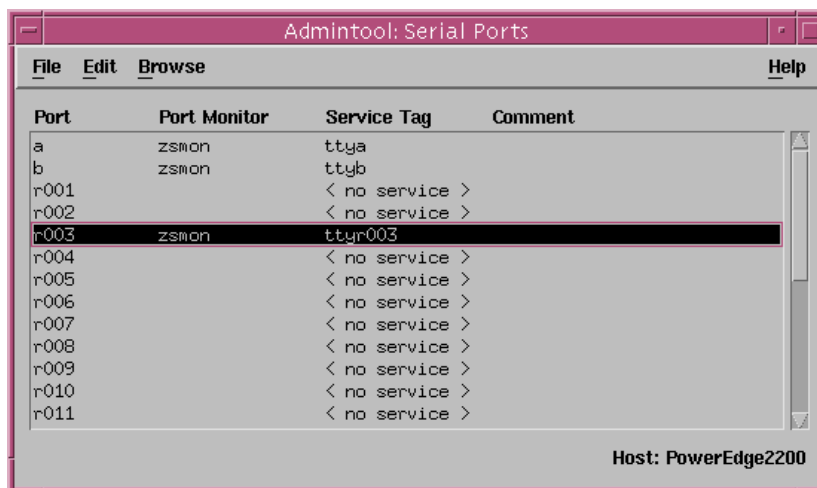
8. In the Modify Serial Port window, click in the **Service Enable** checkbox (displaying a tick) to enable the currently selected serial port.
9. In the Modify Serial Port window, click on the **Baud Rate** selector and choose the Baud rate you want. For example, 9600.
10. In the **Terminal Type** field, enter the terminal type you want.

Note

The terminal type you enter must be a valid terminal type as defined by the **termcap** file. See the Solaris user documentation or on-line help for further details.

11. In the Modify Serial Port window, click on the **OK**

The currently selected serial port now has a terminal session enabled at the specified baud rate, even parity, 7 data bits and 1 stop bit. The Serial Ports window is now updated to show this as shown in the next picture.



12.Repeat steps 5. to 11. until you have configured all the RIO serial ports you require.

Removing RIO serial port terminals

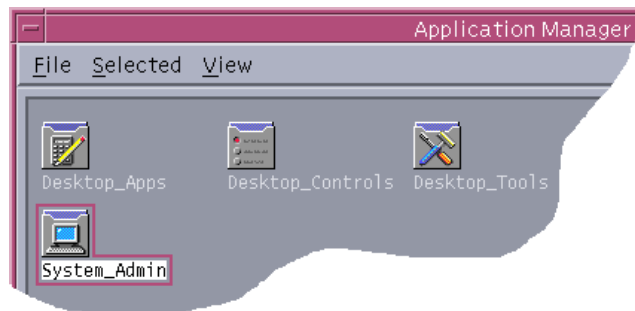
To remove any RIO serial ports configured as terminals proceed as follows;

1. In the Solaris desktop, single click on the **Application Manager** toolbar icon shown in the next picture.

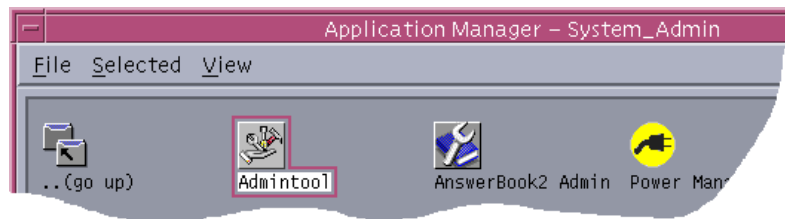
Double click here to start Application Manager.



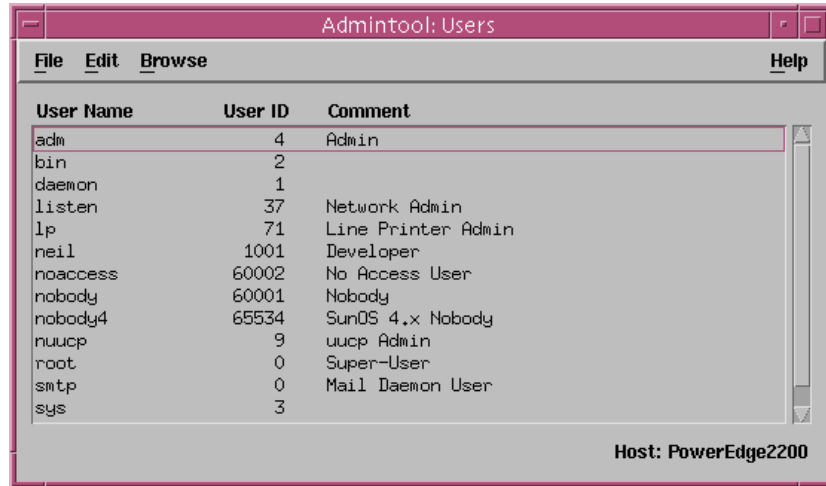
The Application Manager window is now displayed.



2. In the Application Manager window, double click on the **System_Admin** folder.
The System_Admin window is now displayed.

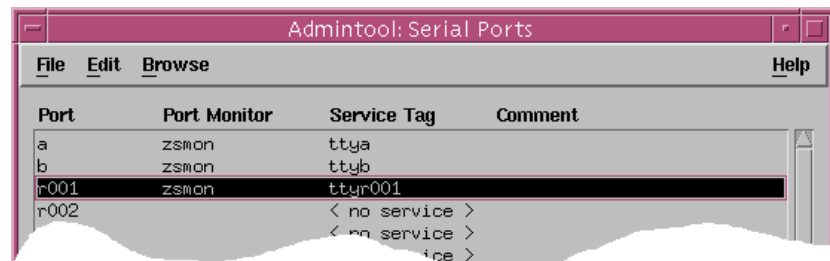


3. In the System_Admin window, double click on the **Admintool** icon.
The main Admintool window is now displayed as shown in the next picture.



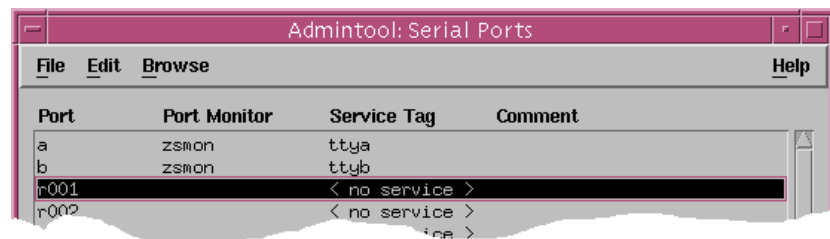
- In the Admintool menu, click on **Browse > Serial Ports**

The Admintool window is now updated to show the serial ports available on the system as shown in the next picture.



- In the Admintool window, single click on the terminal you want to remove to highlight it.
- In the Admintool menu, click on **Select Edit > Delete**.

The terminal entry for the serial port is now deleted and the Admintool window updated.



- Repeat steps 5. to 6. until you have removed all the RIO terminal entries you require.

Updating your RIO system configuration

If you make any changes to your RIO system such as adding or removing an RTA for example, you need to update your system using the **rioconfig** utility to recognise the revised configuration.

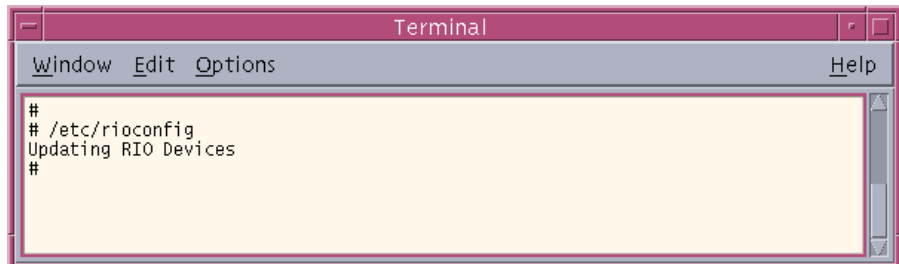
Note

The **rioconfig** utility runs automatically when system first installed (see [Installing device drivers and utilities](#) on page 37) and each time you re-boot the system.

To do this proceed as follows;

- At the command prompt, type **rioconfig** and press the **Enter** key.

The following message is now displayed followed by the return of the command prompt.



```
Terminal
Window Edit Options Help
#
# /etc/rioconfig
Updating RIO Devices
#
```

Your RIO and Solaris system files are now updated to include the revised configuration taking into account any new or removed RTAs and serial ports.

Installing RIO under SCO OpenServer 5

This section tells you how to install host cards, software drivers and utilities under the SCO OpenServer 5 operating system and includes the following;

- [General installation procedure for SCO OpenServer 5](#) on page **51**
- [Installing device drivers and utilities](#) on page **52**
- [Configuring ports with config.rio](#) on page **62**
- [Adding an RTA to the system](#) on page **63**
- [Removing an RTA from the system](#) on page **66**
- [Creating a login for an RTA](#) on page **69**

General installation procedure for SCO OpenServer 5

The general procedure for installing and configuring host cards, Remote Terminal Adaptors drivers software and associated utilities for the SCO OpenServer 5 operating system is as follows:

1. If required, install any PCI host cards you require into your system. See [Installing a PCI host card](#) on page [142](#).
2. If required, install the RIO SCO OpenServer 5 drivers and utilities onto your system using the procedures described in [Installing device drivers and utilities](#) on page [52](#).

Note

To remove the RIO device drivers and utilities from your system, see [Removing device drivers and utilities from your system](#) on page [60](#)

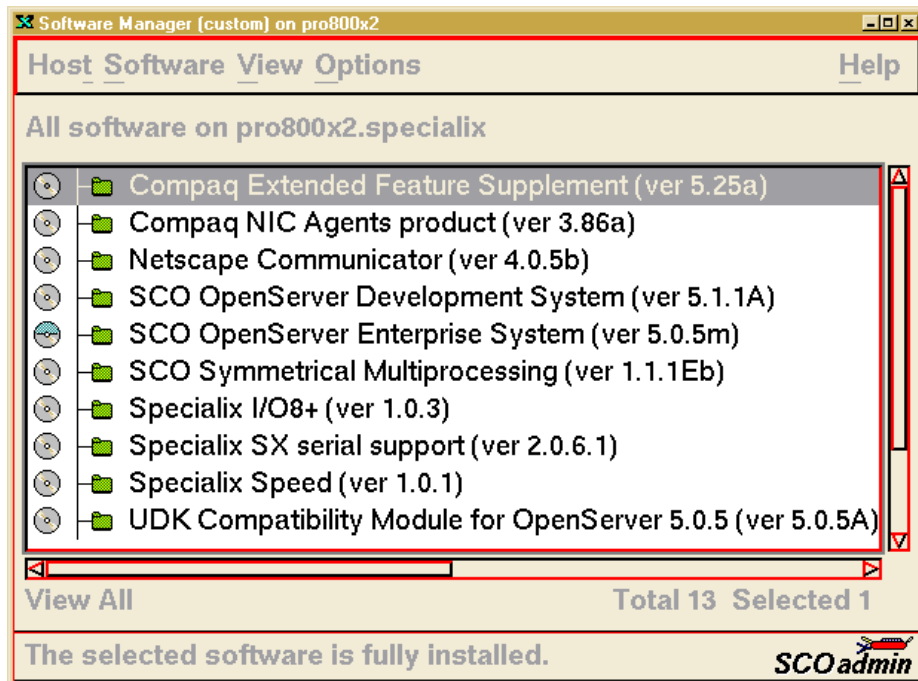
3. If required, install any ISA host cards you require into your system. See [Installing an ISA host card](#) on page [143](#).
4. If required, remove any host cards you want from your system. See [Removing host cards](#) on page [145](#).
5. Install or remove any Remote Terminal Adaptors you require onto your system. See [Installing Remote Terminal Adaptors \(RTAs\)](#) on page [146](#) and [Removing a Remote Terminal Adaptor \(RTA\)](#) on page [158](#).
6. Add any Remote Terminal Adaptors to your system configuration and setup as required using the procedures given in [Adding an RTA to the system](#) on page [63](#).
7. Remove any Remote Terminal Adaptors from your system configuration as required using the procedures given in [Removing an RTA from the system](#) on page [66](#).

Your system is now ready for use. If you add any RTAs to your system following initial installation you need to can create logins for them using the procedures given in [Creating a login for an RTA](#) on page [69](#).

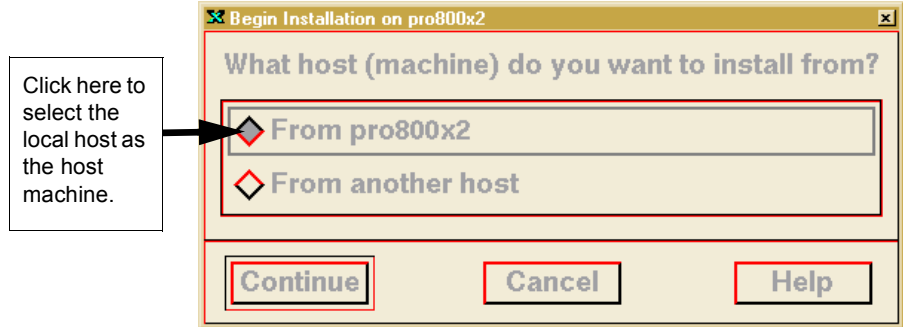
Installing device drivers and utilities

To install the RIO device drivers and utilities for the SCO OpenServer 5 operating system proceed as follows;

1. Login to your system as super user.
2. Load the CDROM into your system CD drive.
3. At the command prompt, type **mount -f ISO9660 -r /dev/cd0 /mnt** and then press the Enter key to mount the CDRO file system
4. In the SCO OpenServer 5 desktop, double click on the System Administration folder.
The System Administration window is now displayed.
5. In the System Administration window, double click on the Software Manager icon.
The Software Manager window is now displayed.

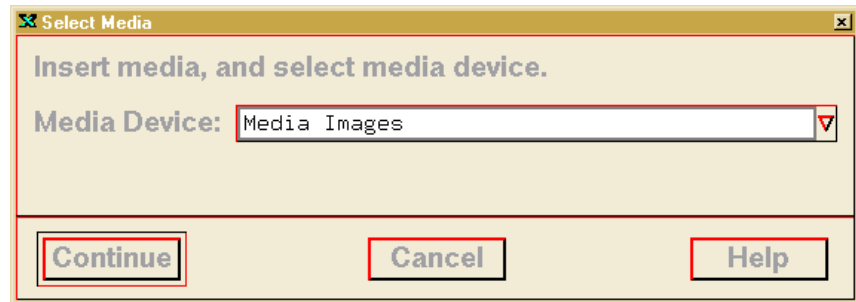


6. In the Software Manager menu, click on **Software > Install New**.
The Begin Installation window is now displayed as shown in the next picture.



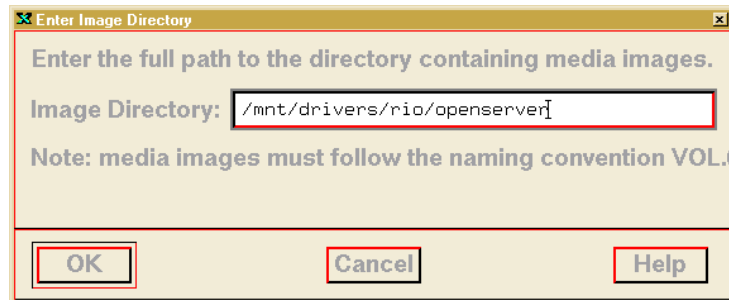
7. In the Begin Installation window, select the local host as the machine to install from by clicking on the **From localhostname** button and then click on **Continue**.

The Select Media window is now displayed.



8. In the Select Media window, using the **Media Device** selector choose the **Media Images** option then click on **Continue**.

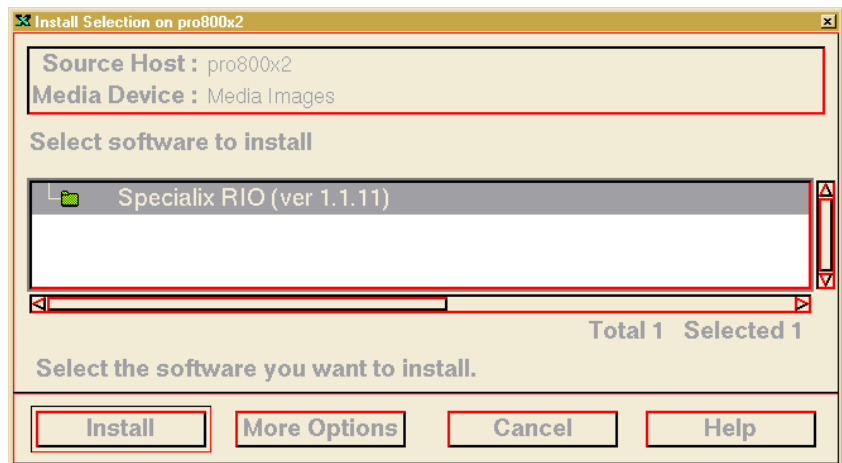
The Enter Image Directory window is now displayed.



9. In the Enter Image Directory window, enter the following in the Image directory field;
/mnt/drivers/rio/openserver

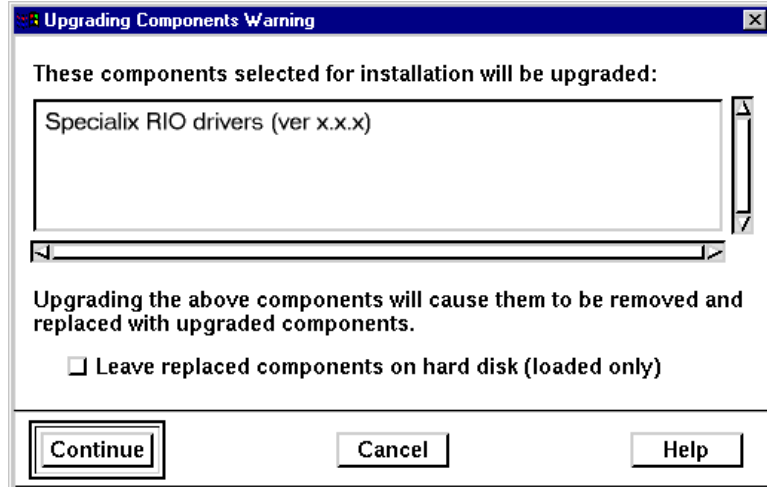
10. In the Enter Image Directory window, click on **OK**.

The Install Selection window is now displayed.



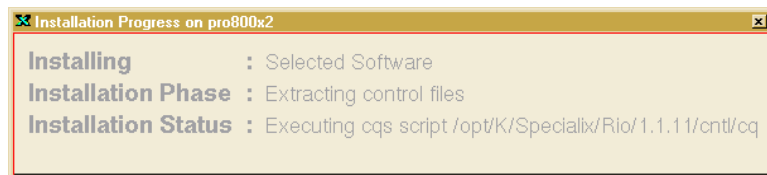
11. In the Install Selection window, click on the **Install** button.

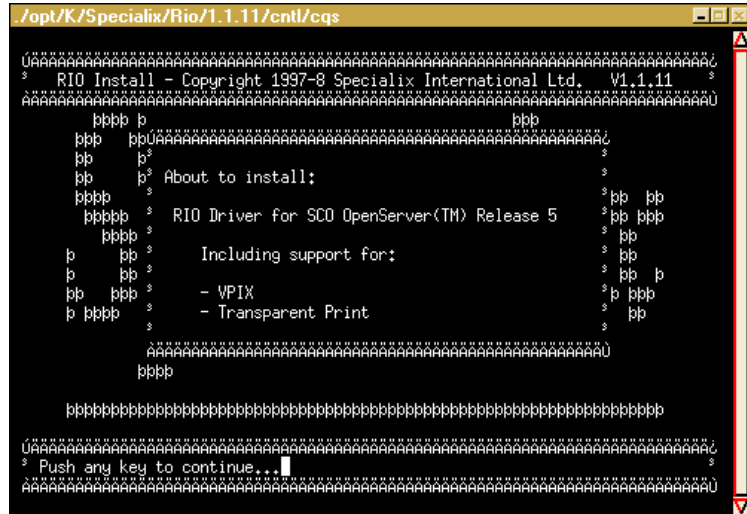
If you are upgrading your current Perle RIO device driver, a pop-up window is now displayed as shown in the next picture.



12. In the pop-up window, click on the **Continue** button to continue the installation process

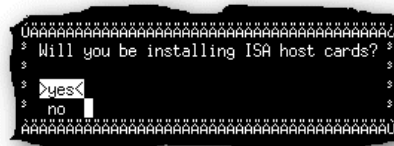
The following progress message is now displayed, followed by the RIO Install window as shown in the next pictures.





13. Now Press the **Enter** key to continue with your installation.

A prompt window is now displayed asking you if you wish to install ISA cards.



14. If you wish to install PCI cards now go to step **15.** of this procedure, for ISA cards go to step **19.**

PCI cards

15.To configure PCI cards, at the **Will you be installing ISA cards?** prompt, select **no**

A message window is now displayed


```

*****
2 The device driver will correctly recognise all types of RIO 3
2 host cards that have been configured into your system using 3
2 the System Configuration Utility provided with your 3
2 computer. 3
2 Configuration files for RIO ISA & EISA host 3
2 cards are available on the DOS UTILITIES diskette supplied 3
2 with the RIO host card. 3
*****

```

16. Press the Enter key to close the message window and continue.

A message window is now displayed prompting you to select the operating mode for your host cards.

```

pppp pp pp pppppp pp pp pp
UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
$ How will the cards operate?          $ bp
$
>interrupt driven, if possible<        $ bp
force into polled mode                 $
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAUU

```

17. In the message window, select the **force into polled mode** option and press the **Enter** key

Note

We recommend using **force into polled mode** to avoid using up valuable interrupt resources. Selecting this option does not produce any loss in performance.

A prompt window is now displayed asking you whether or not you wish to re-enter hardware details.

```

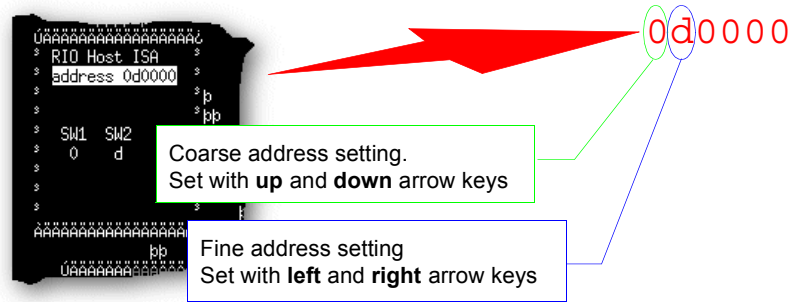
UAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
$ Re-enter hardware details? $
$ $
$ yes $
$ No $
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAUU

```

18. At the prompt, select **no**.

Configuration of PCI cards is now completed.

22. Using the keys shown in the next picture, set the address you want for the currently selected host card. Then press the **Enter** key to confirm your selection.



23. Press the **Enter** key to continue the installation.

A prompt is now displayed asking whether or not you want to re-enter hardware details.



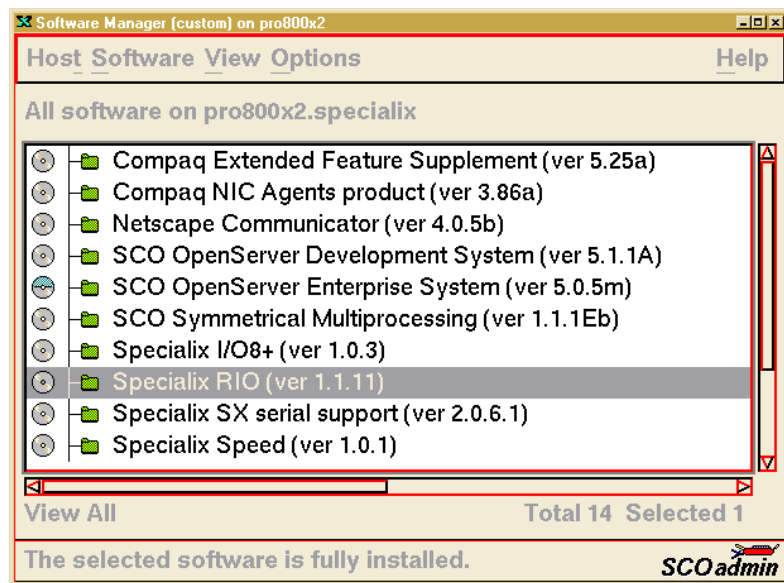
24. At the prompt, select **no**.

Configuration of ISA cards is now completed.

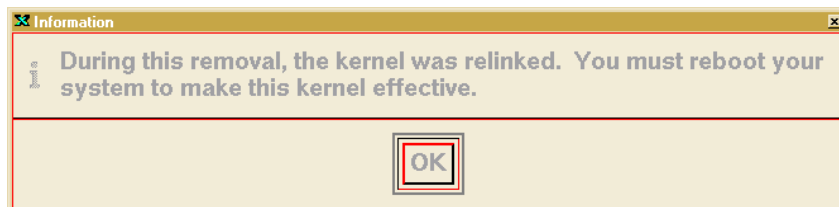
Removing device drivers and utilities from your system

To remove the RIO device drivers and utilities for the SCO OpenServer 5 operating system proceed as follows;

1. In the SCO OpenServer 5 desktop, double click on the System Administration folder.
The System Administration window is now displayed.
2. In the System Administration window, double click on the software manager icon.
The Software Manager window is now displayed.



3. In the Software Manager window select the driver you want to remove.
4. In the Software Manager menu, click on **Software > Remove software**.
A confirmation window is now displayed prompting you to confirm removal
5. In the confirmation window, click on the **Remove** button.
The software is now removed and the following Kernel re-link message is now displayed as shown in the next picture.



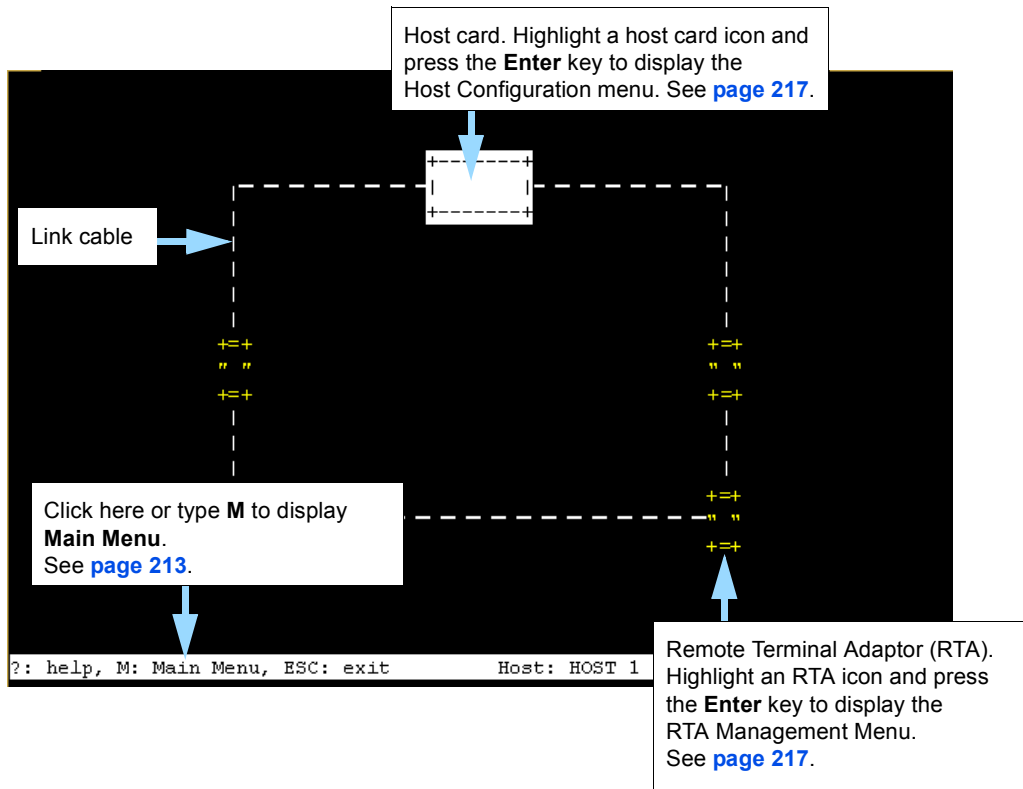
The Kernel re-link message window now closes and the removal continues. A message is displayed upon completion.

6. In the message window, click on **OK** to close the window.

The software manager window is now updated to show the remaining software.

Configuring ports with config.rio

Under the SCO OpenServer 5 operating system, RIO includes an application for configuring ports called **config.rio**. Config.rio provides a real time map of your system showing the Remote Terminal Adaptors, link cables and host cards and so forth that make up your system.



Any changes you make to your RIO system are automatically updated on the system map. For details of using config.rio, see the following;

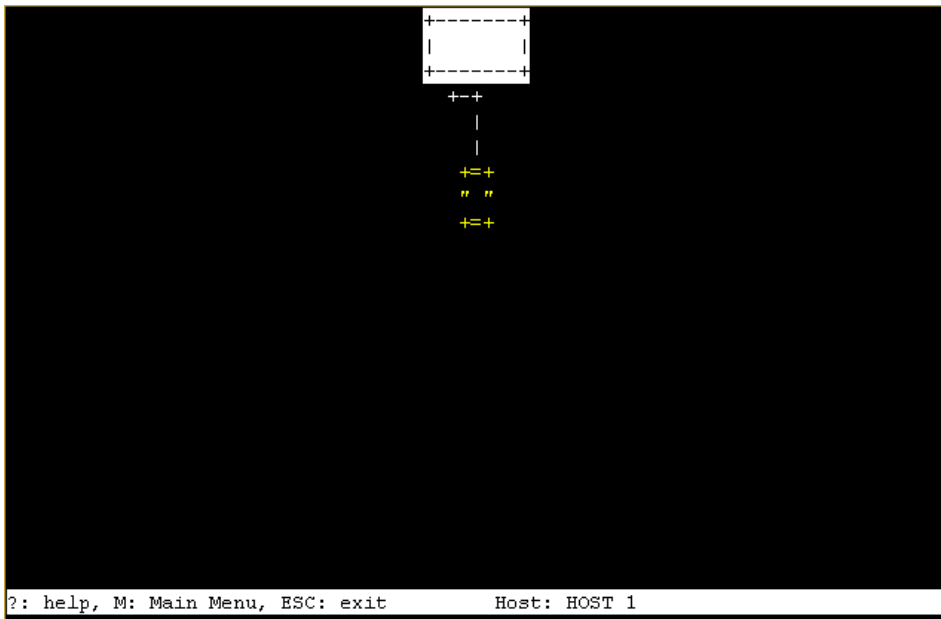
- [Adding an RTA to the system](#) on page [63](#)
- [Removing an RTA from the system](#) on page [66](#)
- [Creating a login for an RTA](#) on page [69](#)

Adding an RTA to the system

To add an RTA to your system configuration, proceed as follows;

1. Physically install the Remote Terminal Adaptor in your system using the procedures detailed in [Installing Remote Terminal Adaptors \(RTAs\)](#) on page 146.
2. Login to your system as super user.
3. At the command prompt, type **config.rio** and press the **Enter** key.

The RIO configuration utility window is now displayed showing a map of your system. See [Configuring ports with config.rio](#) on page 62 for more details about how config.rio works.



4. In the RIO configuration utility window, highlight the unconfigured RTA you want to add to the system.

Note

The way in which an unconfigured RTA is displayed depends on the types of terminal being used. Normally, either the RTA icon flashes or appears in a different colour.

5. Press the **Enter** key.

The RTA Management menu is now displayed.

```
RTA Management
>View RTA settings<
Configure RTA
Reboot RTA
Zombie RTA
Identify RTA
RTA bound to Host: No
```

6. In the RTA Management menu, click on **Configure RTA**.

A prompt window is now displayed asking you for a name for the selected RTA.

```
New name:
```

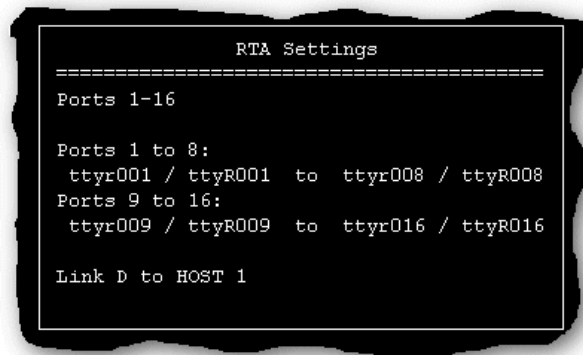
```
?
```

7. In the prompt window, enter the RTA name you want and press the **Enter** key.
The TTY configuration menu is now displayed.

```
TTY Configuration
```

```
>Use default TTY blocks (ttyr001 - ttyr008 and ttyr009 - ttyr016)<
Select TTY blocks
```

8. In the TTY configuration menu, click on **Use default TTY blocks** and press the **Enter** key.
You are now returned to the RTA Management menu.
9. If required, check your configuration settings as follows; In the RTA Management menu, click on **View RTA settings**.
The RTA Settings window is now displayed as shown in the next picture.



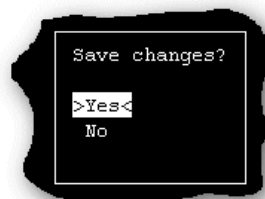
10. If you are happy with the configuration settings press the **ESC** key to close the window. Otherwise, repeat step 4. onwards of this procedure to change the configuration as required.

Note

The changes you have made to the system configuration will not take effect until you exit the config.rio utility.

11. Press the **Esc** key twice

A prompt window is now displayed asking you if you want to save changes before exiting config.rio.



12. In the prompt window, select **Yes** and press the **Enter** key.

The config.rio utility now closes down and the system is updated to use your new configuration.

Hint

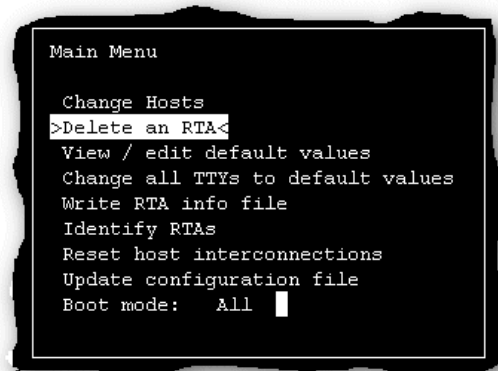
To save and update the configuration changes without exiting proceed as follows;

- In the Main Menu, click on **Update configuration file**.

Removing an RTA from the system

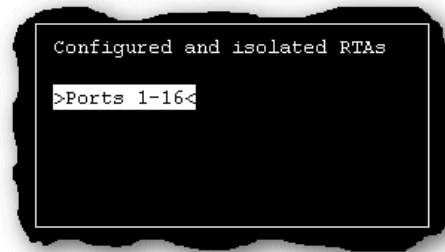
To remove an RTA from your system configuration, proceed as follows;

1. Physically remove the Remote Terminal Adaptor from your system using the procedures detailed in [Removing a Remote Terminal Adaptor \(RTA\)](#) on page 158.
2. Login to your system as super user.
3. At the command prompt, type **config.rio** and press the **Enter** key.
The RIO configuration utility window is now displayed.
4. Press the **Enter** key.
The Main Menu is now displayed.



5. In the Main menu, click on **Delete an RTA**.

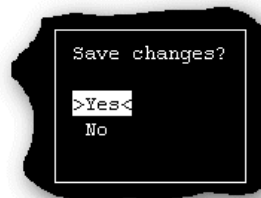
A popup window is now displayed showing the currently inactive RTAs.



6. In the pop-up window select the RTA you wish to remove and press the **Enter** key.
A confirmation prompt is now displayed, asking if you want to delete the selected RTA.



7. At the confirmation prompt, select **Yes** and press the **Enter** key.
8. Press the **Esc** key twice
A prompt window is now displayed asking you if you want to save changes before exiting config.rio.



9. In the prompt window, select **Y** and press the **Enter** key.

The config.rio utility now closes down and the system is updated to use your new configuration.

Hint

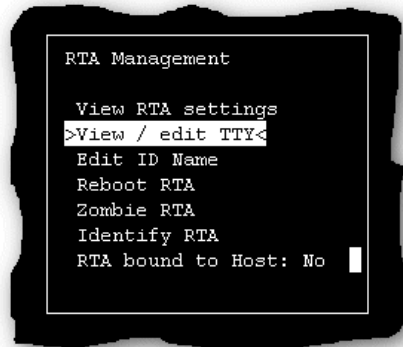
To save and update the configuration changes without exiting proceed as follows;

- In the Main Menu, click on **Update configuration file**.

Creating a login for an RTA

To create a login for an RTA in your system configuration, proceed as follows;

1. Login to your system as super user.
2. At the command prompt, type **config.rio** and press the **Enter** key.
The RIO configuration utility window is now displayed.
3. In the RIO configuration utility window, highlight the RTA you want to create a login for and then press the **Enter** key.
The RTA Management menu is now displayed.



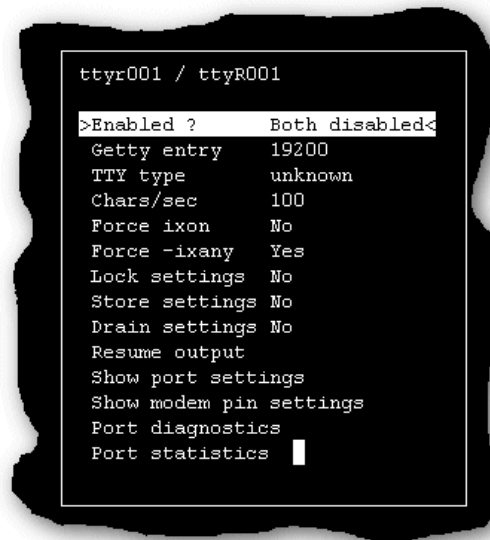
4. In the RTA Management menu, click on **View / edit TTY**.
The View / edit TTY window is now displayed as shown in the next picture.

View / edit TTY

```
>ttyr001 / ttyR001<
ttyr002 / ttyR002
ttyr003 / ttyR003
ttyr004 / ttyR004
ttyr005 / ttyR005
ttyr006 / ttyR006
ttyr007 / ttyR007
ttyr008 / ttyR008
ttyr009 / ttyR009
ttyr010 / ttyR010
ttyr011 / ttyR011
ttyr012 / ttyR012
ttyr013 / ttyR013
ttyr014 / ttyR014
ttyr015 / ttyR015
ttyr016 / ttyR016
```

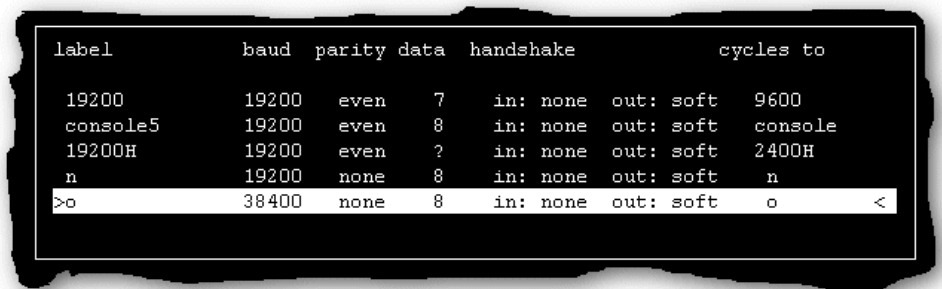
- In the View / edit TTY window use the up and down arrow keys to select the TTY you want to add a login to and press the **Enter** key.

The tty menu is now displayed.



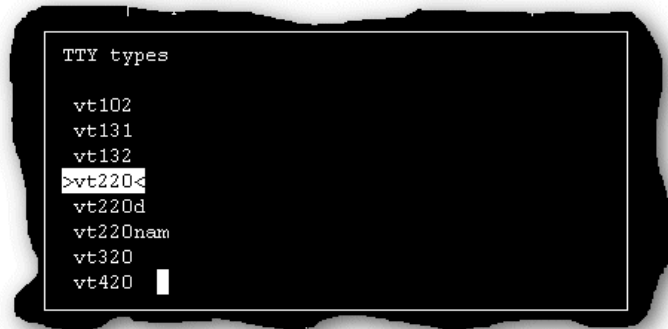
- In the tty menu, click on **Getty entry** and press the **Enter** key.

A pop-up window is now displayed showing the available getty definitions.



- In the pop-up window, use the up and down arrow keys to select the getty definitions entry you want to use and then press the **Enter** key.

The TTY types menu is now displayed as shown in the next picture.



8. In the TTY types menu select the terminal type you want to attach to the tty and press the **Enter** key to return to the tty menu.
9. In the tty menu click on **Enabled?** and press the **Enter** key.
The TTY en/disable menu is now displayed.



10. In the TTY en/disable menu, click on **TTY enabled** and press the **Enter** key to return to the tty menu.
11. Press the **Esc** key three times to exit config.rio.

Installing RIO under SCO UnixWare

This section tells you how to install host cards, software drivers and utilities under the SCO UnixWare operating system and includes the following;

- [General installation procedure for SCO UnixWare](#) on page **74**
- [Installing device drivers and utilities](#) on page **75**
- [Assigning ISA host card address and IRQ levels](#) on page **76**
- [Configuring ports with config.rio](#) on page **79**
- [Adding an RTA to the system](#) on page **80**
- [Removing an RTA from the system](#) on page **83**
- [Removing device drivers and utilities from your system](#) on page **86**
- [Creating a login for an RTA](#) on page **86**

General installation procedure for SCO UnixWare

The general procedure for installing and configuring host cards, Remote Terminal Adaptors drivers software and associated utilities for the SCO UnixWare operating system is as follows:

1. If required, install any PCI host cards you require into your system. See [Installing a PCI host card](#) on page [142](#).
2. If required, install the RIO SCO UnixWare drivers and utilities onto your system using the procedures described in [Installing device drivers and utilities](#) on page [75](#).

Note

To remove the RIO device drivers and utilities from your system, see [Removing device drivers and utilities from your system](#) on page [86](#).

3. If required, install any ISA host cards you require into your system. See [Installing an ISA host card](#) on page [143](#).
4. If required, remove any host cards you want from your system. See [Removing host cards](#) on page [145](#).
5. Install or remove any Remote Terminal Adaptors you require onto your system. See [Installing Remote Terminal Adaptors \(RTAs\)](#) on page [146](#) and [Removing a Remote Terminal Adaptor \(RTA\)](#) on page [158](#).
6. Add any Remote Terminal Adaptors to your system configuration and setup as required using the procedures given in [Adding an RTA to the system](#) on page [80](#).
7. Remove any Remote Terminal Adaptors from your system configuration as required using the procedures given in [Removing an RTA from the system](#) on page [83](#).

Your system is now ready for use. If you add any RTAs to your system following initial installation you need to can create logins for them using the procedures given in [Creating a login for an RTA](#) on page [86](#)

Installing device drivers and utilities

To install the RIO device drivers and utilities for the SCO UnixWare operating system proceed as follows;

1. Login to your system as root.
2. Load the CDROM into your system CD drive.
3. Mount the CDROM by typing the following at the command prompt;
mount -r -Fcdfs -0 nmconv=c /dev/cdrom/cdrom1 /mnt

Note

The exact syntax of this command may differ slightly on different versions of SCO UnixWare. For details of exact syntax, please consult the documentation supplied with your operating system.

4. Press the **Enter** key.
5. At the command prompt, type
pkgadd -d /mnt/drivers/rio/unixware/riouw.pkg rio and then press the **Enter** key.
A series of progress messages is now displayed finishing with the command prompt.
6. Reboot your system.

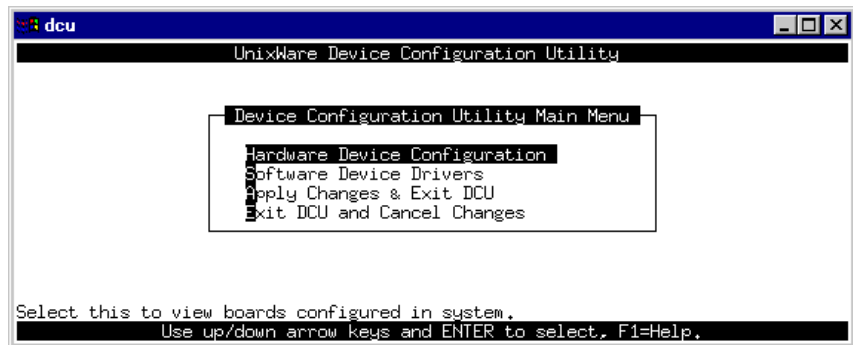
The RIO device drivers and utilities for the SCO UnixWare are now installed and activated.

Assigning ISA host card address and IRQ levels

In order to function, each ISA host card must be allocated an available I/O address and IRQ level. The Device Configuration Utility allows you to determine the available addresses and IRQ levels, then allocate them to a particular host card. To do this proceed as follows;

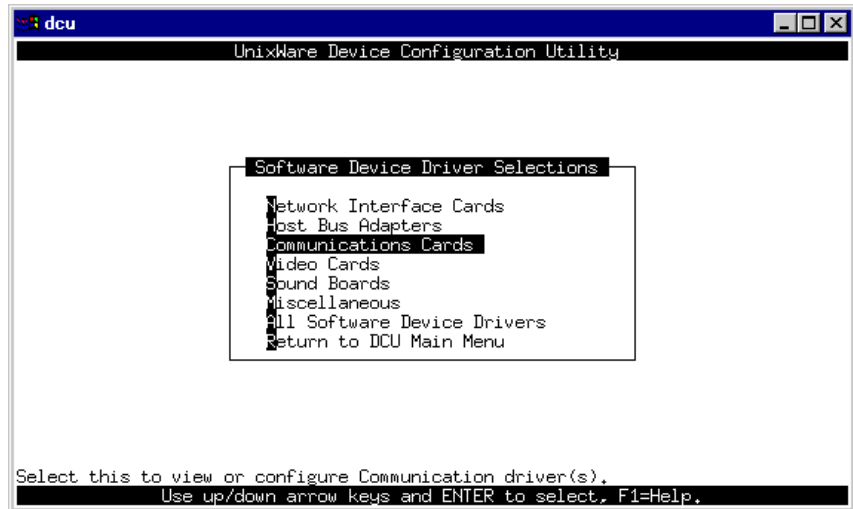
1. At the command prompt, type **dcu** and press the **Enter** key.

The Unixware Device Configuration Utility window is now displayed.



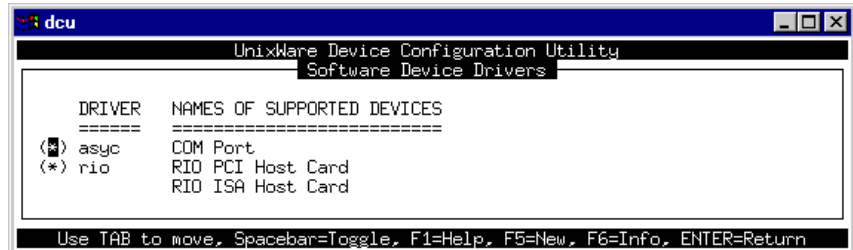
2. In the DCU Main Menu, select the **Software Device Drivers** option and press the **Enter** key

The Software Device Driver selections menu is now displayed.



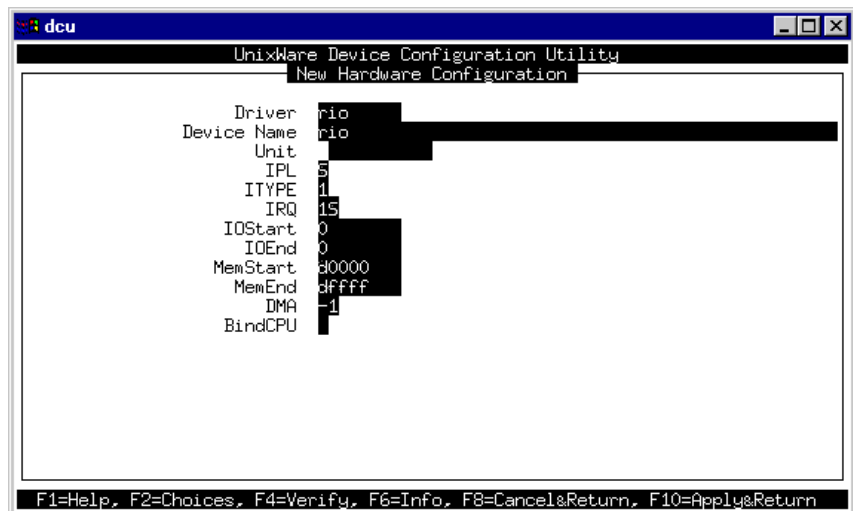
3. In the Software Device Driver selections menu, click on the **Communications Cards** option and press the **Enter** key.

The Software Device Drivers window is now displayed



4. In the Software Device Drivers window, select the RIO driver (hint use the arrow keys to move the cursor) and then press the **F5** key to add the new host card.

The New Hardware Configuration window is now displayed.



5. In the New Hardware Configuration window, set the parameters listed in the next table to the values indicated.

Note

The **MemStart** and **MemEnd** values you set here must correspond to the values set on the host card as detailed in [Installing an ISA host card](#) on page 143.

The **IRQ level** should be an IRQ that is not already in use by the system.

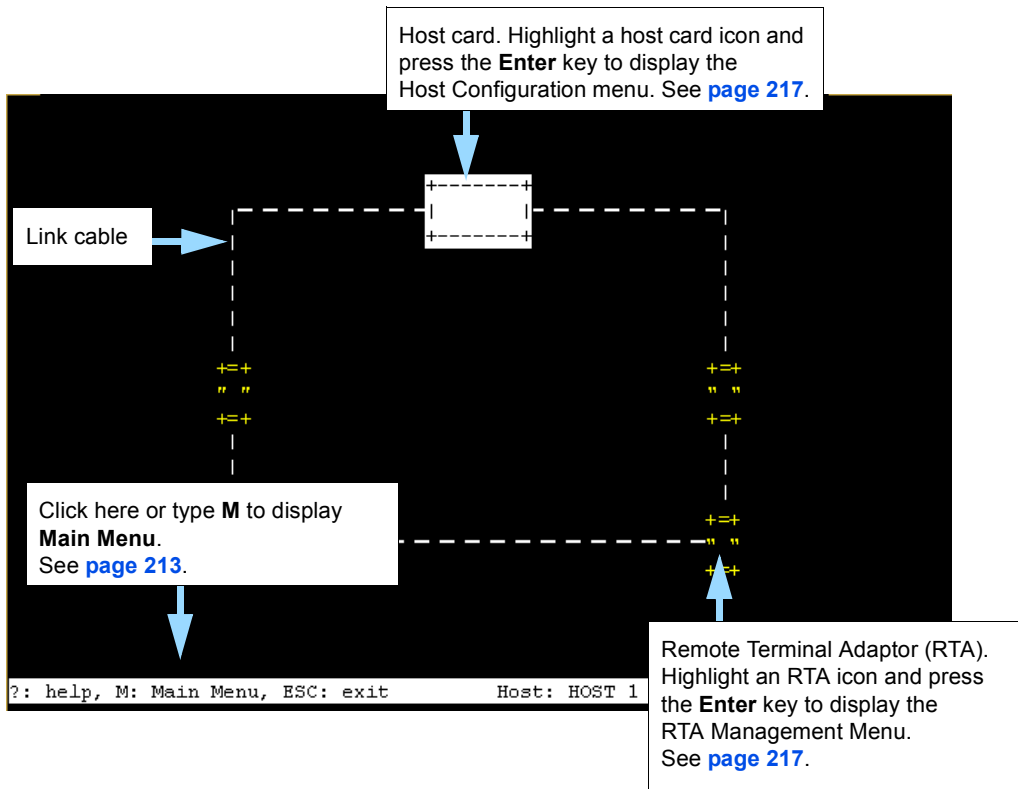
Parameter	Set to..
MemStart	d0000
MemEnd	dffff
IRQ level	15

6. Press the **F10** key to accept the changes then press the **Enter** key to return to the Software Device Driver Selections menu.
7. In the Software Device Driver Selections menu, select **Return to DCU**.
8. In the Device Configuration Utility Main Menu, select **Apply Changes and Exit DCU**.
9. Re-boot your system.

ISA host configuration is now complete.

Configuring ports with config.rio

Under the SCO UnixWare operating system, RIO includes an application for configuring ports called **config.rio**. Config.rio provides a real time map of your system showing the Remote Terminal Adaptors, link cables and host cards and so forth that make up your system.



Any changes you make to your RIO system are automatically updated on the system map. For details of using config.rio, see the following;

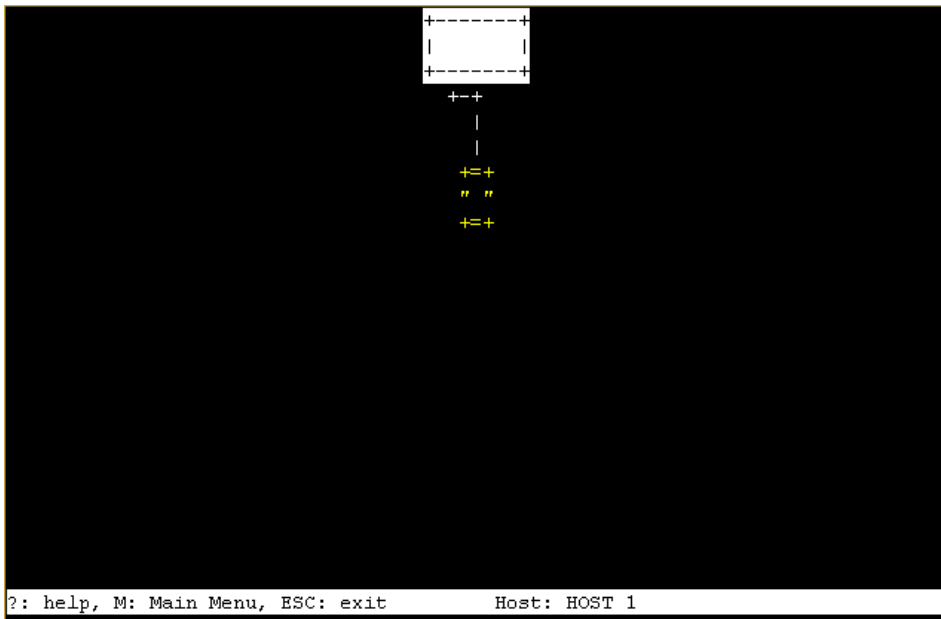
- [Adding an RTA to the system](#) on page 80
- [Removing an RTA from the system](#) on page 83

Adding an RTA to the system

To add an RTA to your system configuration, proceed as follows;

1. Physically install the Remote Terminal Adaptor in your system using the procedures detailed in [Installing Remote Terminal Adaptors \(RTAs\)](#) on page 146.
2. Login to your system as super user.
3. At the command prompt, type **config.rio** and press the **Enter** key.

The RIO configuration utility window is now displayed showing a map of your system. See [Configuring ports with config.rio](#) on page 79 for more details about how config.rio works.



4. In the RIO configuration utility window, highlight the unconfigured RTA you want to add to the system.

Note

The way in which an unconfigured RTA is displayed depends on the types of terminal being used. Normally, either the RTA icon flashes or appears in a different colour.

5. Press the **Enter** key.

The RTA Management menu is now displayed.


```
RTA Management
>View RTA settings<
Configure RTA
Reboot RTA
Zombie RTA
Identify RTA
RTA bound to Host: No
```

6. In the RTA Management menu, click on **Configure RTA**.

A prompt window is now displayed asking you for a name for the selected RTA.

```
New name:
```

```
?
```

7. In the prompt window, enter the RTA name you want (for example, Sales or Ports 1-8) and press the **Enter** key.

The TTY configuration menu is now displayed.

```
TTY Configuration
```

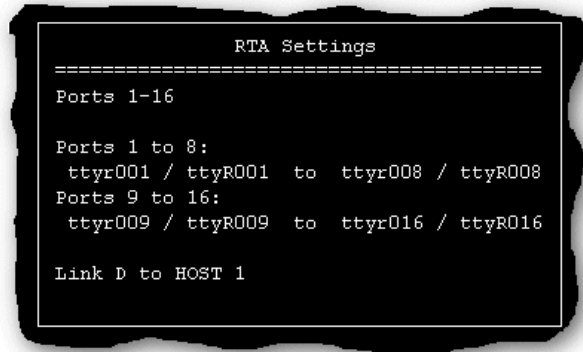
```
>Use default TTY blocks (ttyr001 - ttyr008 and ttyr009 - ttyr016)<
Select TTY blocks
```

8. In the TTY configuration menu, click on **Use default TTY blocks** and press the **Enter** key.

You are now returned to the RTA Management menu.

9. If required, check your configuration settings as follows; In the RTA Management menu, click on **View RTA settings**.

The RTA Settings window is now displayed as shown in the next picture.



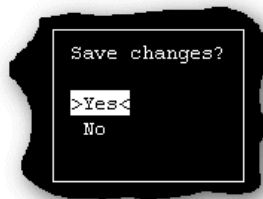
10. If you are happy with the configuration settings press the **ESC** key to close the window. Otherwise, repeat step 4. onwards of this procedure to change the configuration as required.

Note

The changes you have made to the system configuration will not take effect until you exit the config.rio utility.

11. Press the **Esc** key twice

A prompt window is now displayed asking you if you want to save changes before exiting config.rio.



12. In the prompt window, select **Yes** and press the **Enter** key.

The config.rio utility now closes down and the system is updated to use your new configuration.

Hint

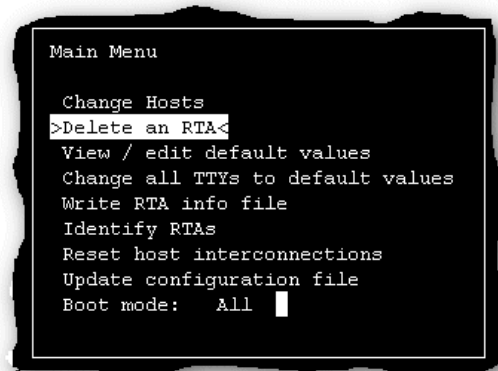
To save and update the configuration changes without exiting proceed as follows;

- In the Main Menu, click on **Update configuration file**.

Removing an RTA from the system

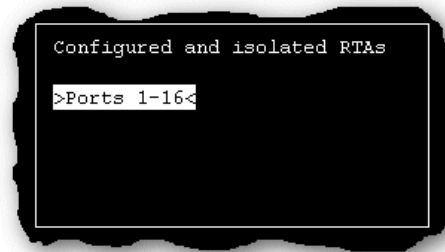
To remove an RTA from your system configuration, proceed as follows;

1. Physically remove the Remote Terminal Adaptor from your system using the procedures detailed in [Removing a Remote Terminal Adaptor \(RTA\)](#) on page 158.
2. Login to your system as super user.
3. At the command prompt, type **config.rio** and press the **Enter** key.
The RIO configuration utility window is now displayed.
4. Press the **Enter** key.
The Main Menu is now displayed.



5. In the Main menu, click on **Delete an RTA**.

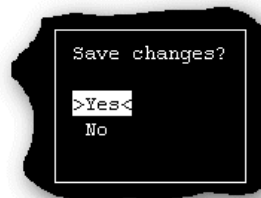
A popup window is now displayed showing the currently inactive RTAs.



6. In the pop-up window select the RTA you wish to remove and press the **Enter** key.
A confirmation prompt is now displayed, asking if you want to delete the selected RTA.



7. At the confirmation prompt, select **Yes** and press the **Enter** key.
8. Press the **Esc** key twice
A prompt window is now displayed asking you if you want to save changes before exiting config.rio.



9. In the prompt window, select **Y** and press the **Enter** key.

The config.rio utility now closes down and the system is updated to use your new configuration.

Hint

To save and update the configuration changes without exiting proceed as follows;

- In the Main Menu, click on **Update configuration file**.

Removing device drivers and utilities from your system

To remove the RIO device drivers and utilities from your system under SCO UnixWare, proceed as follows;

1. Login to your system as root.
1. At the command prompt, type **pkrm rio** and then press the **Enter** key.
2. Re-boot your system.

Creating a login for an RTA

To create a login for an RTA under SCO UnixWare, you use the **spxadmpport** utility. To do this proceed as follows (this example uses a terminal 9600, 8,1, N on RIO port r001);

1. At the command prompt, type **/etc/spxadmpport add r001 9600R root** and press the **Enter** key.

Creation of the login is now complete. For more information about **spxadmpport**, see [spxadmpport utility for configuring ports](#) on page 225 in [Chapter 4 Quick Reference](#).

Installing RIO under Windows NT

This section tells you how to install host cards, software drivers and utilities under the Windows NT operating system and includes the following;

- [General setup procedure for Windows NT](#) on page **88**
- [Installing device drivers and utilities](#) on page **89**
- [Configuring ISA host cards](#) on page **92**
- [Configuring PCI host cards](#) on page **95**
- [Configuring Remote Terminal Adaptors](#) on page **96**
- [Making and displaying changes to your system configuration](#) on page **98**

General setup procedure for Windows NT

The general procedure for installing RIO for the Windows NT operating system is as follows:

1. If required, install any PCI host cards you require into your system. See [Installing a PCI host card](#) on page 142.
2. Install the RIO Windows NT drivers and utilities onto your system using the procedures described in [Installing device drivers and utilities](#) on page 89.
3. Using the RIO Configuration utility, add the names of any PCI cards to your system configuration using the procedure given in [Configuring PCI host cards](#) on page 95.
4. Add your ISA host card settings to the system configuration. See [Configuring ISA host cards](#) on page 92.
5. Install any ISA host cards you require into your system. See [Installing an ISA host card](#) on page 143.
6. Install the links you require in your system using one of the procedures shown in the next table.

Link type	For procedure see...
Short distance	Installing a short distance link on page 159
Medium distance	Installing a Fibre Optic Link Kit (FOLK) on page 160
Long distance	Installing a Long Distance Module (LDM) on page 162
Fault tolerant	Installing a fault tolerant link on page 174
Dual host fail-safe	Installing a dual host fail-safe link (UNIX only) on page 175

7. Install and remove Remote Terminal Adaptors as required for your system. see [Installing Remote Terminal Adaptors \(RTAs\)](#) on page 146 and [Removing a Remote Terminal Adaptor \(RTA\)](#) on page 158.

Note

If you connect a new device to your RIO system, for example an RTA, you need to add the ports to the system using the procedures described in [Making and displaying changes to your system configuration](#) on page 98.

8. Using the RIO Configuration utility, configure RTAs and associated serial ports you have added to the system. See [Configuring Remote Terminal Adaptors](#) on page 96.

Your system is now ready for use. If required, you can reconfigure the system following initial installation. See [Making and displaying changes to your system configuration](#) on page 98 for details.

Installing device drivers and utilities

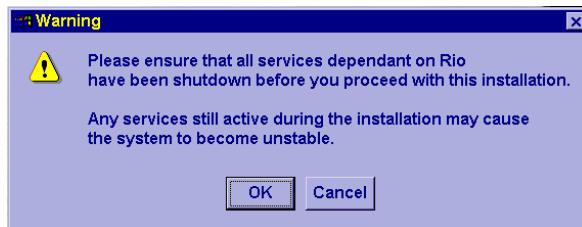
To install the RIO device drivers on your system proceed as follows;

1. Turn on your PC and login to your system as administrator. Then load the CDROM into your systems CD drive.
2. Start the windows Explorer (or file manager) and display the `\drivers\rio\winnt\` directory.
3. In the `\drivers\rio\winnt\` directory, double click on the **setup.exe** file.

The Install Shield window is briefly displayed.

Note

If you have previously installed RIO software, a warning message is now displayed asking you to shutdown all RIO dependent devices. This is because the device drivers updated during the installation process can only be updated properly if communication to all RIO dependent devices is stopped.



The Welcome window is now displayed.



4. In the Welcome window, click on the **Next >** button.

The Choose Destination window is now displayed as shown in the next picture.



If you want to use a directory other than the suggested default, click on the Browse button then use the browser displayed to select the directory you want.

5. In the Choose Destination window, click on the **Next >** button.

The Select Program Folder window is now displayed.



6. In the Select Program Folder window, select the folder to which you want to add the program icons and click on the **Next >** button.

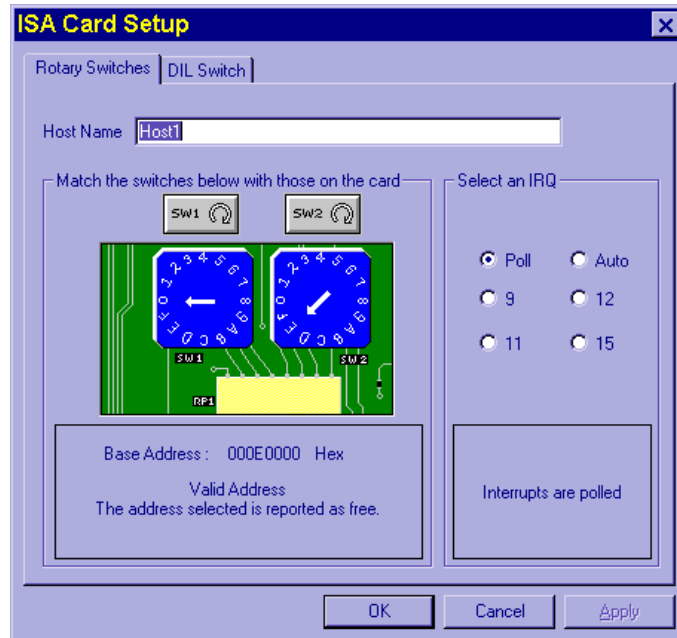
A progress message window is now displayed.

Upon completion of the installation process a program group window is displayed showing the RIO configuration icon.

Configuring ISA host cards

To configure an ISA host card prior to actual installation proceed as follows;

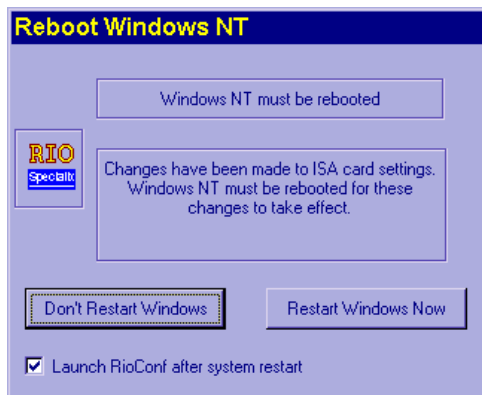
1. In the Windows desktop, display the Perle program group window.
2. In the Perle program group window, double click on the RIO icon.
The RIO Configuration window is now displayed showing a blank map on the RIO Configuration screen.
3. In the RIO Configuration menu, click on **Commands > Add ISA host card**.
The ISA Card Setup tabbed window now appears.
4. In the ISA Card Setup tabbed window, click on the **Rotary Switches** tab to display the **Rotary Switches** page.



5. In the **Rotary Switches** page set the host card parameters detailed in the next table (if the defaults are insufficient):

Parameter	Action required
Host name	Change the default host name to whatever you wish
Select an IRQ	<p>Select an IRQ value, or better, choose 'Poll' or 'Auto'.</p> <p>The default is polled mode, which is an alternative to IRQ level setting and is useful when the range of available interrupts is restricted. If you choose Poll, the driver will poll the card regularly for data. When installing more than one card, set the IRQ value to Poll for all the cards.</p> <p>The Auto interrupt option is an alternative to IRQ level setting and will assign the first available interrupt. If you have reserved in the BIOS an IRQ specifically for ISA cards, you need to select the IRQ number from the list since the Auto option will not automatically use that reserved IRQ.</p>
SW1 and SW2	<p>To change the address of an ISA card fitted with rotary switches, click (or use tab to highlight) the buttons marked SW1 and then SW2. Then use the space bar to increment the address, watching the message output in the bottom left of the dialogue box.</p> <p>To change the address of an ISA card fitted with a DIL switch, click the switches of the 10-way DIL switch displayed in the dialogue box.</p> <p>Make a note of the settings; you will need to set them on the card itself.</p>

- In the ISA Card Setup tabbed window, click on the **Apply** button to save changes and close the window.
The RIO driver will check that the memory address and interrupt that you have selected are not already being used. If either resource is being used, you will be asked to reselect.
- In the RIO Configuration window menu, click on **File > Exit** to exit the utility.
The Reboot Windows NT window is now displayed as shown in the next picture.



8. In the Reboot Windows NT window, click on the **Launch RioConf** check box to ensure that the RIO Configuration utility is launched automatically the next time Windows is restarted.
9. In the Reboot Windows NT window, click on the **Don't Restart Windows** button to avoid restarting Windows before you have physically installed the host card.
10. Shutdown Windows and switch off your machine.

You can now install your ISA host cards. See [Removing host cards](#) on page [145](#).

Configuring PCI host cards

The PCI host card is plug and play however, under Windows NT a small amount of configuration is required. To install and configure a PCI card under Windows NT, proceed as follows;

Note

Although plug and play, some machine BIOSs require that you assign IRQs to each PCI **slot** in order to make a PCI card use interrupts.

You cannot change the interrupt or memory address of the PCI card.

1. Install the PCI host card into your system using the procedures detailed in [Installing a PCI host card](#) on page 142.
2. Switch on your computer system.

Note

During bootup, the operating system will select automatically an interrupt and memory address for the card.

3. In the Windows desktop, display the Perle program group window.
4. In the Perle program group window, double click on the RIO icon.
The RIO Configuration window is now displayed showing the RIO PCI card on the map display.
5. In the RIO Configuration window, double-click on the card and give it a name.

You can now continue with the rest of your system installation as detailed in [General setup procedure for Windows NT](#) on page 88.

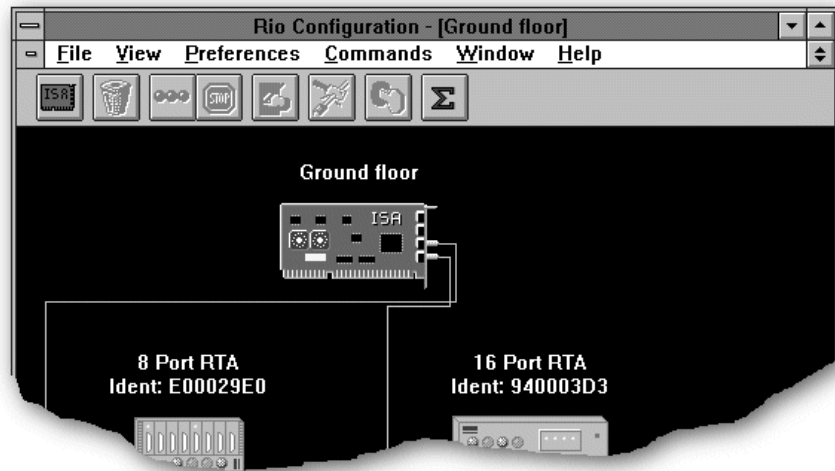
Configuring Remote Terminal Adaptors

Following installation of your Remote Terminal Adaptors (RTAs) you need to configure your system using the RIO Configuration Utility. To do this proceed as follows:

1. Install your RTA units using the procedures detailed in [Installing Remote Terminal Adaptors \(RTAs\)](#) on page 146.

1. In the windows desktop, display the Perle program group window.
2. In the Perle program group window, double click on the RIO icon.

The Rio Configuration window is now displayed.



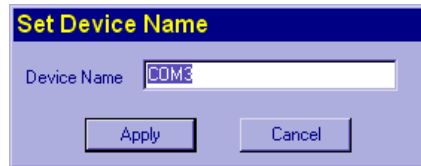
3. In the Rio configuration window single click on the RTA you wish to select.
A red line should appear around the RTA symbol.
4. In the Rio Configuration Menu, click on **Commands > Configure** .
The Remote Terminal Adaptor Configuration window is now displayed.
5. In the Remote Terminal Adaptor Configuration window, click in the **RTA Name** field and edit the RTA name and ident number as required.

Hint

To return to the default name for the card, click on the **default** button.

6. In the Remote Terminal Adaptor Configuration window, single click on each port you want to configure (highlighting it) then click on the **Setup** button.

The Set Device Name window is now displayed.



7. In the Set Device name window, change the device name as required and click on the **Apply** button.

Hint

We recommend using COM as the default port prefix. Any change that you do make will only affect ports configured subsequently to the change.

To quicken the naming of ports in the Remote Terminal Adaptor Configuration window select the **Enumerate** button. This action will allow you to number all the remaining ports sequentially, using the currently selected port as the starting number.

8. In the Remote Terminal Adaptor Configuration window, click on the **Apply** button to effect your settings.

Making and displaying changes to your system configuration

This section describes how to make and view changes made to your system following initial configuration under Windows NT using the RIO configuration utility.

The following sections are provided;

- [Introduction](#) on page [99](#)
- [Displaying multiple networks](#) on page [100](#)
- [Printing a copy of the system map](#) on page [100](#)
- [Identifying an RTA](#) on page [101](#)
- [Displaying a port configuration summary](#) on page [102](#)
- [Adding a Fault Tolerant Link](#) on page [103](#)
- [Adding an RTA to your system configuration](#) on page [103](#)
- [Adopting Port Names](#) on page [104](#)
- [Moving an RTA](#) on page [105](#)
- [Removing an RTA](#) on page [105](#)
- [Disconnecting an RTA from within the software](#) on page [105](#)
- [Re-booting an RTA](#) on page [106](#)
- [Adding a Host Card](#) on page [106](#)
- [Removing a Host Card](#) on page [106](#)
- [Manually loading the module and firmware](#) on page [136](#)

Introduction

Once you have installed your RIO system under Windows NT, you can view changes to your RIO system using the RIO Configuration utility. The map(s) of the system displayed in the RIO Configuration utility will respond automatically to changes to your RIO system.

Note

When the RIO Configuration utility is not running, The RIO software will store any changes to your system and will update the display when you next run the RIO Configuration utility.

Note

In the event of link failure or disconnection, the broken link will disappear from the system map displayed in the RIO Configuration window and any isolated RTAs on the system map now appear greyed out.

As soon as the link is restored, the map is updated automatically to display the new or resumed link. (RIO will remember the configuration of your RTA(s). There is no need to reconfigure the unit(s).

Displaying multiple networks

If you have more than one card installed, you can display the additional network(s) of RTAs on the RIO Configuration utility in separate windows.

Hint

Use the Tile Option from the Windows menu to place the different windows next to one another, so you can see all the networks simultaneously.

Printing a copy of the system map

RIO allows you to print a copy of the system of the system map displayed in the RIO Configuration utility. To do this proceed as follows;

1. In the RIO Configuration utility window, click on the **File > Print** menu option
2. Use the standard windows printing options now displayed to print a copy of your system map.

Note

You can choose to print the whole topology or just a section of it.

Identifying an RTA

To display the identity of an RTA on the system map proceed as follows;

1. In the windows desktop, display the Perle program group window.
2. In the Perle program group window, double click on the RIO icon.

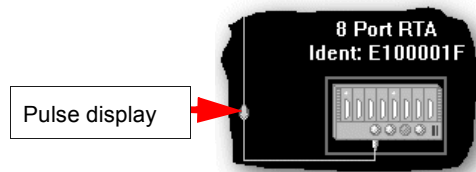
The Rio Configuration window is now displayed showing a map of your RIO system.

3. In the Rio Configuration window, select the RTA(s) you wish to identify physically; (control - click to select more than one RTA).
4. In the Rio Configuration menu, click on **Commands > Identify**.

The system map now displays a pulse moving along the link between the host card and the selected RTA(s) and the LEDs are flashed on the actual RTAs you have identified.

Hint

If you wish to identify multiple RTAs, note the pattern of flashing lights visible on the RTA symbols on the system map in the Rio Configuration window. The flashing pattern is unique to each RTA, so you can then match the pattern of flashing LEDS on the actual RTAs.



5. When you have finished identifying the RTAs you want, in the Rio configuration menu, click on **Commands > Stop identify** to disable the identify feature.

The Identify feature now cancels (over the next 5 seconds) and the flashing lights cease on both the RTA symbol and unit.

Displaying a port configuration summary

RIO allows you to display a summary of configuration settings for each port. To do this proceed as follows;

1. In the windows desktop, display the Perle program group window.
2. In the Perle program group window, double click on the RIO icon.
The Rio Configuration window is now displayed.
3. In the Rio Configuration menu, click on **Windows > Summary**.
The Summary window is now displayed.
4. In the Summary window, single click on a port in the **RIO defined Ports** list.
A configuration summary for the selected port is now displayed in the Summary window.
5. Repeat step 4. until you have viewed all the configuration summaries you require then click on the **Close** button to close the window.

Adding a Fault Tolerant Link

When you add a fault tolerant link to your RIO system it is displayed on the system map in a different colour to normal links (usually grey). Fault tolerant links are detected and displayed automatically in the RIO Configuration window in the same way as standard links.

For more information about fault tolerant links, see [Fault tolerant link](#) on page 28 and [Installing a fault tolerant link](#) on page 174.

Adding an RTA to your system configuration

When you add additional RTAs to your system, they are added to the system map displayed in the RIO Configuration window automatically. New RTAs will display their default names and electronic serial numbers. To change these, see [Identifying an RTA](#) on page 101 and [Adopting Port Names](#) on page 104.

Note

You can install up to 128 ports per host card. If you install one too many, RIO will detect it but won't be able to assign it an ID. On the system map, the RTA will appear but without a link (despite you having physically connected it).

Adopting Port Names

When you are installing a new RTA, the RIO Configuration utility allows you to adopt the port names of RTAs no longer connected to the system (known as orphaned). Typically, you use this facility because you want to replace a failed RTA or you are replacing an RTA with a unit which has a different physical interface.

To adopt port names in this way proceed as follows;

1. In the RIO Configuration window, locate the on the orphaned RTA you want to use.
2. Connect the new RTA to your system. See [Installing Remote Terminal Adaptors \(RTAs\)](#) on page 146.

The system map is now updated to show the new RTA.

3. In the RIO Configuration window, single click on the new RTA to select it.
4. In the RIO Configuration menu, click on **Commands > Configure**.

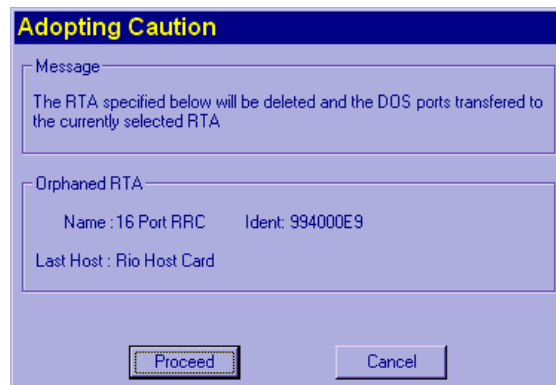
The Remote Terminal Adaptor Configuration window is now displayed.

5. In the Remote Terminal Adaptor Configuration window, click on the **Adopt** button.

The Adopt window is now displayed.

6. In the Adopt window, use the Orphaned RTA selector to choose the RTA whose ports you want to adopt and then click on the **Adopt** button.

A caution message window now appears.



7. In the caution message window, click on the **Proceed** button to complete the adoption process.

The orphaned RTA is now deleted from the system map.

Moving an RTA

Under windows NT RIO allows you to relocate a previously configured RTA within your RIO system without further configuration. The device driver will detect its ID and configuration automatically, and will relocate the unit on the system map in the RIO Configuration window.

For details on installing RTAs, see [Installing Remote Terminal Adaptors \(RTAs\)](#) on page 146.

Removing an RTA

To remove an RTA from your system under Windows NT proceed as follows;

1. Remove the RTA from your system using the procedures detailed in [Removing a Remote Terminal Adaptor \(RTA\)](#) on page 158.
2. In the RIO Configuration window, single click on the RTA you want to remove from the system.
3. In the RIO Configuration menu, click on **Commands > Remove**.

The ports that were assigned to the RTA are now added to the list of available ports.

Note

If you fail to delete RTAs from the system map configuration, the RIO system will assume the ports associated with that RTA are still installed and subsequently reject any new RTAs added to the system.

Disconnecting an RTA from within the software

The RIO configuration utility allows you to disconnect an RTA from the system without physically unplugging it. This process is known as **zombieing**. To disconnect an RTA in this way proceed as follows;

1. In the RIO Configuration window, single click on the RTA you want to zombie.
2. In the RIO Configuration menu, click on **Commands > Zombie**.

On the system map the RTA is now disconnected (orphaned) from the host and becomes dimmed.

Note

To remove an RTA from a zombied state, go to the unit and re-power it. The map should update itself to show the RTA connected once more.

Re-booting an RTA

You can re-boot an RTA through the Configuration Utility, without going to the RTA unit:

1. In the RIO Configuration window, single click on the RTA you want to re-boot.
2. In the RIO Configuration menu, click on **Commands > Reboot**.

A pop-up window now appears asking you whether you wish to close ports before re-booting, or to re-boot and close ports simultaneously.

3. In the pop-up window, select the option you want and action your choice.

The selected RTA is now re-booted.

Adding a Host Card

When you add host cards to your system the configuration required by the user depends on the type of host card you are installing as shown in the next table.

Host card type	Action required
PCI	No action required by the user.
ISA	Use the procedure described in Configuring ISA host cards on page 92.

Removing a Host Card

To remove a host card from your system under Windows NT proceed as follows;

1. Remove all the RTAs associated with the host card from your system using the procedures detailed in [Removing a Remote Terminal Adaptor \(RTA\)](#) on page 158.
2. In the RIO Configuration window, single click on the host card you want to remove from the system.
3. In the RIO Configuration menu, click on **Commands > Remove**.

The system map now shows the card as removed,

You can now shutdown your machine and remove the card. See [Removing host cards](#) on page 145.

Installing RIO under Windows 2000

This section describes how to install RIO under Microsoft Windows 2000.

This section includes the following;

- [General setup procedure for Windows 2000](#) on page [108](#)
- [Installing drivers and utilities](#) on page [110](#)
- [Adding ISA host cards to the system](#) on page [112](#)
- [Viewing and changing the resources for a device](#) on page [115](#)
- [Configuring serial ports](#) on page [118](#)
- [Configuring the polled mode and quick close settings for a host card](#) on page [120](#)
- [Removing devices and ports from the system](#) on page [123](#)
- [Identifying RTAs](#) on page [126](#).

General setup procedure for Windows 2000

The general procedure for installing RIO for the Windows 2000 operating system is as follows:

1. If required, install any PCI host cards you require into your system. See [Installing a PCI host card](#) on page [142](#)
2. Install the RIO Windows 2000 drivers and utilities onto your system using the procedures described in [Installing drivers and utilities](#) on page [110](#).
3. If required, using the Windows 2000 **Add/Remove Hardware wizard**, add ISA host cards you want to the system using the free addresses available. See [Adding ISA host cards to the system](#) on page [112](#).
4. Repeat step [3](#). until you have assigned addresses to all the ISA host cards you want to install.
5. If required, install any ISA host cards you require into your system. See [Installing an ISA host card](#) on page [143](#)
6. Install the links you require in your system using one of the procedures shown in the next table;

Link type	For procedure see...
Short distance	Installing a short distance link on page 159
Medium distance	Installing a Fibre Optic Link Kit (FOLK) on page 160
Long distance	Installing a Long Distance Module (LDM) on page 162
Fault tolerant	Installing a fault tolerant link on page 174
Dual host fail-safe	Installing a dual host fail-safe link (UNIX only) on page 175

7. Install and remove Remote Terminal Adaptors as required for your system. see [Installing Remote Terminal Adaptors \(RTAs\)](#) on page [146](#) and [Removing a Remote Terminal Adaptor \(RTA\)](#) on page [158](#).

Note

If you connect a new device to your RIO system, for example an RTA, the new ports are added to the system automatically. No action is required by the user.

8. Using the Windows 2000 **Device Manager**, configure the serial ports you have added to the system. See [Configuring serial ports](#) on page [118](#).

Your system is now ready for use. If required, you can reconfigure the system following initial installation. See [Configuring the polled mode and quick close settings for a host card](#) on page [120](#), [Removing devices and ports from the system](#) on page [123](#), and [Removing devices and ports from the system](#) on page [123](#) for details.

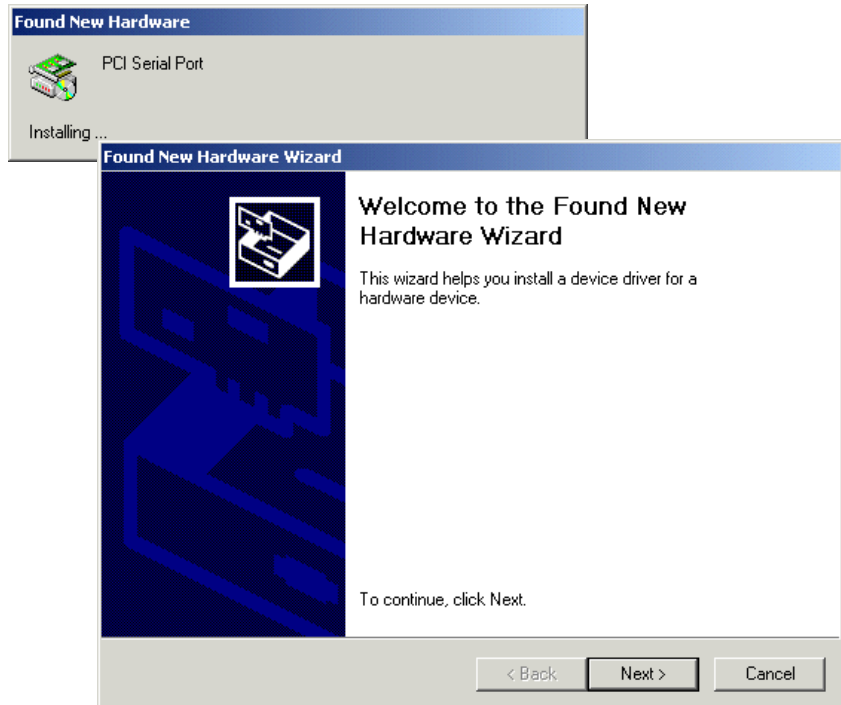
To identify an RTA from within the software. See [Identifying RTAs](#) on page [126](#).

Installing drivers and utilities

To install the RIO device drivers on your system proceed as follows;




1. Turn on your PC and if required, log in.

If you have installed any new host cards a Found New Hardware message is briefly shown followed by the Found New Hardware wizard as shown in the pictures.

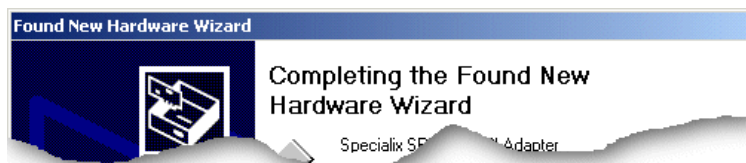


2. In the Found New Hardware wizard click on the **Next >** button.

3. Using the instructions given in the next table, use the Found New Hardware wizard to install your device drivers.

In this Wizard page	Do the following...
 <p>Install Hardware Device Drivers A device driver is a software program that allows an operating system to communicate with a hardware device.</p>	<ol style="list-style-type: none"> a. In the Install Hardware Device Drivers page, select the Search for a suitable device driver for my device option and click on the Next > button.
 <p>Locate Driver Files Where do you want to search for driver files?</p>	<ol style="list-style-type: none"> b. In the Locate Driver Files page, select the Specify a location option and then click on the Next > button. A pop-up window now appears prompting you for the location of the drivers you want to install. c. In the pop-up select a location for the Copy manufacturer's files from field and click on OK. The Driver Files Search Results page is now displayed showing the driver windows has selected for you.
 <p>Driver Files Search Results The wizard has finished searching for driver files.</p>	<ol style="list-style-type: none"> d. In the Driver Files Search Results page, click on the Next > button To use the suggested driver.

The driver now starts and adds ports resulting from the cards you've installed. A message displays on completion.



4. Click on the **Finish** button to close the wizard.

Installation of drivers is now complete.

Adding ISA host cards to the system

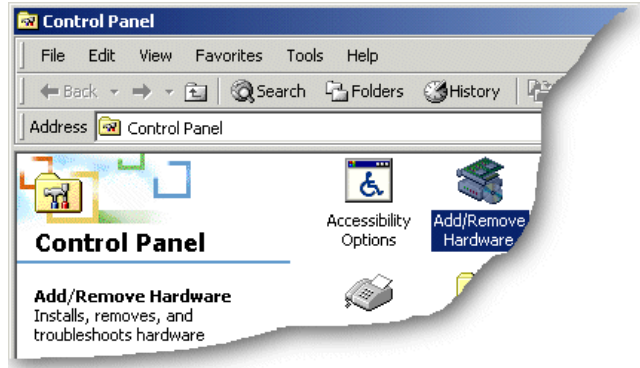
When you physically install an ISA host card in your system you also need to add the card to the list of installed devices in the system.

To add ISA host cards to your system proceed as follows;




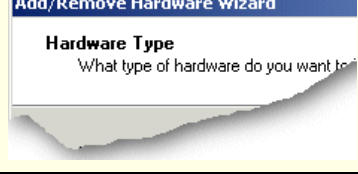
Note



The addresses used by RIO host cards are normally set by default.
This procedure is used when you wish to set non-standard addresses.

1. In the Windows desktop, click on the **Start** button and select **Settings > Control Panel**
The control panel window is now displayed.



2. In the control panel window, double click on the **Add/Remove Hardware** icon.
The Add/Remove Hardware Wizard is now displayed.
3. Using the instructions given in the next table, use the Add/Remove Hardware Wizard to assign the host card addresses and IRQ levels you require.

In this Wizard page	Do the following...
	<p>4. In the Add/Remove Hardware Wizard, select Add/Troubleshoot a device and press the Next > button.</p> <p>The Choose a Hardware Device page is now displayed.</p>
	<p>5. In the Choose a Hardware Device page, scroll up the list of devices and click on Add a new device, then click on the Next > button.</p> <p>The Find New Hardware page is now displayed.</p>
	<p>6. In the Find New Hardware page, select No, I want to select the hardware from a list and click on the Next > button.</p> <p>The Hardware Type page is now displayed.</p>
	<p>7. In the Hardware Type page, select Multi-port serial adaptors and click on the Next > button.</p>

In this Wizard page	Do the following...
	<p>The Select a Device Driver page is now displayed.</p> <p>8. If your host card type isn't shown, in the Select a Device Driver page click on the Have Disk button.</p> <p>A message window is now displayed which prompts you for the driver and location you want to use.</p> <p>9. In the message window, enter or select the driver you want and click on the OK button to accept settings and close the window.</p> <p>The Select a Device Driver page is now updated to show the new driver you have selected.</p> <p>10. In the Select a Device Driver page, select the manufacturer and model you require, then click on the Next > button.</p> <p>The Start Hardware Installation page is now displayed.</p>
	<p>11. In the Start Hardware Installation page, click on the Next > button to accept your choice.</p> <p>A completion message page is now displayed as shown in the next picture</p>



12. In the completion message page click on the **Finish** button to complete the new configuration.

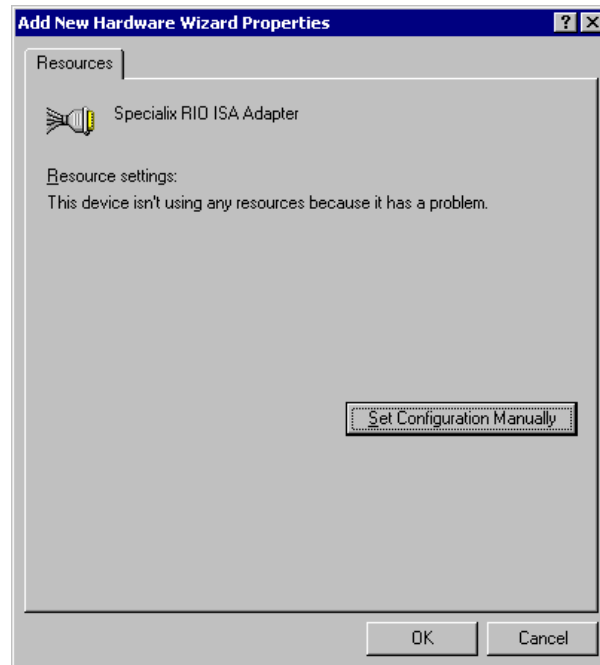
Viewing and changing the resources for a device

To view or change the resources for a device proceed as follows;

1. In the Add/Remove Hardware Wizard go to the last page and click on the Resources button.

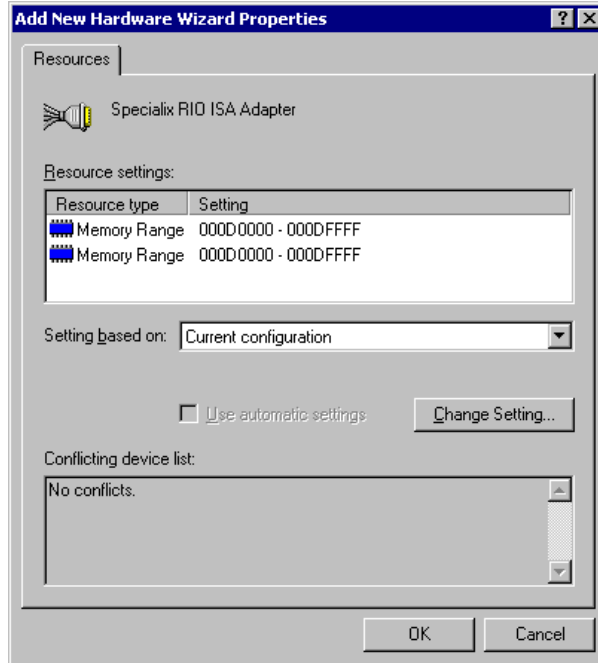


The Add New Hardware Wizard properties window is now displayed.



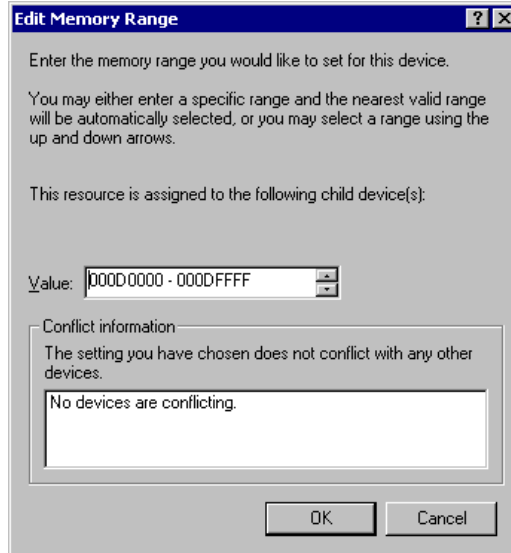
2. In the Add New Hardware Wizard properties window, select the **Resources** page and click on the **Set Configuration Manually** button.

The resources page is now updated to show the settings for the current installed RIO device.



3. In the Add New Hardware Wizard properties window, select the **Resource type** you require and click on the **Change Setting** button.

The Edit Memory Range window is now displayed.



4. In the Edit Memory Range window, enter the memory range you want and click on the **OK** button.

If values you have selected are not acceptable to the system, then the Device Manager will display a problem icon as shown in the next picture.



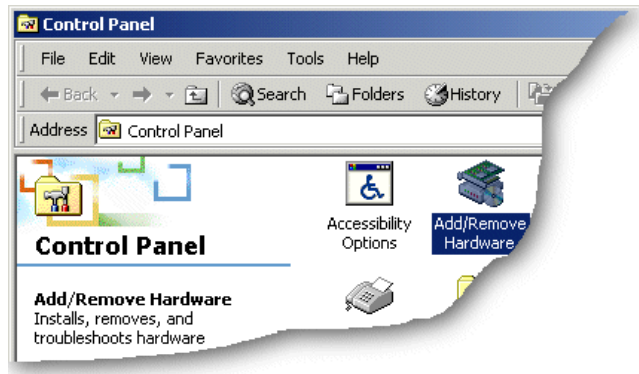
5. If the memory settings you have selected are not acceptable to the system, check your configuration settings and adjust memory address as required. Otherwise ring Technical support.

Configuring serial ports

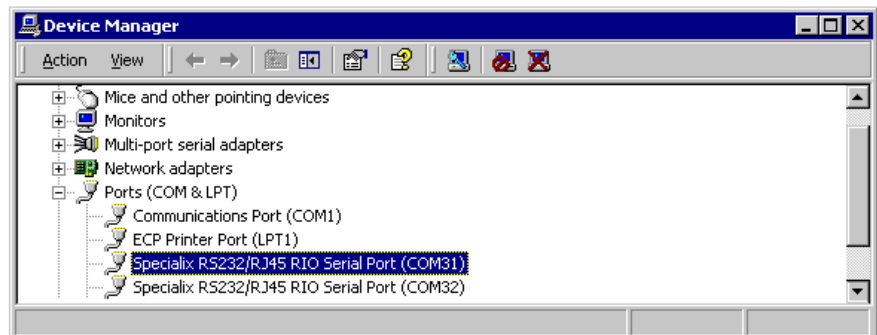
To configure RIO serial ports under Windows 2000, proceed as follows;

1. In the Windows 2000 desktop, click on the **Start** button and select **Settings > Control Panel**

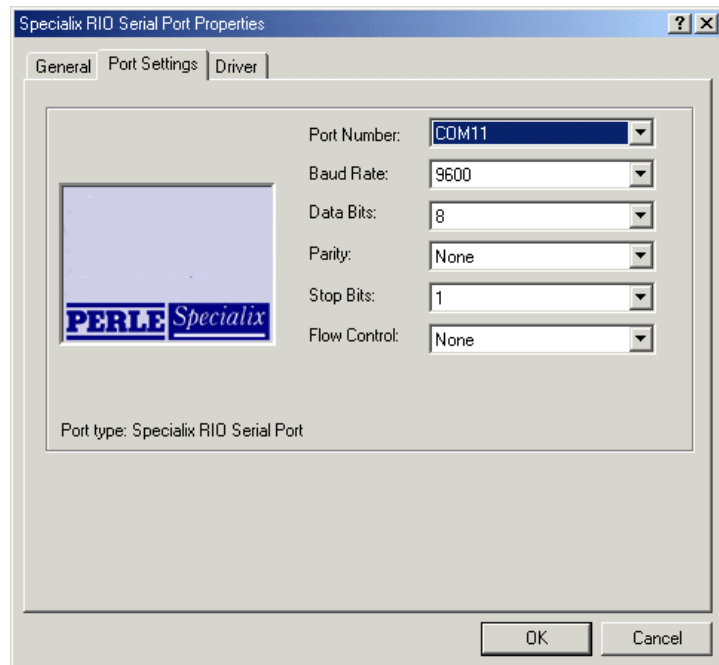
The control panel window is now displayed.



2. In the Control Panel window, click on the **System** icon.
The System Properties tabbed window is now displayed.
3. In the System Properties window, click on the **Hardware** tab.
The hardware page is now displayed.
4. In the Hardware page, click on the **Device Manager** Button.
The Device Manager window is now displayed.



5. In the Device Manager window, click on the Multiport serial adapters icon to display the currently installed devices.
6. In the Device Manager window, double click on the device whose properties you want to view or change
The device Properties tabbed window is now displayed.
7. In the device Properties window, click on the **Port Settings** tab to display the Port Settings page.



8. In the Port Settings page, set the **Port Number**, **Baud Rate** and other configuration parameters you require and then click on the **OK** button to save changes and close the window.

The configuration process is now complete.

Configuring the polled mode and quick close settings for a host card

Polled mode

Rio allows some basic configuration of host cards under Windows 2000 as follows;

Under Windows 2000, RIO allows you to run the PCI card in polled mode i.e. without using interrupts. This facility is useful when the normal interrupt levels used by RIO are not available or you have a larger number of host cards than available interrupt levels.

Note

RIO cards are always set to polled mode. This cannot be changed by the user.

Quick close facility

When a RIO port is closed in software, the close will not complete until all data in the buffers has been transmitted. This maintains data integrity. Under windows 2000, a quick close facility is available which allows the system to close a port immediately when requested to do. This facility is useful when you want to reduce the time taken to close a collection of ports, but final data integrity is not important.

Note

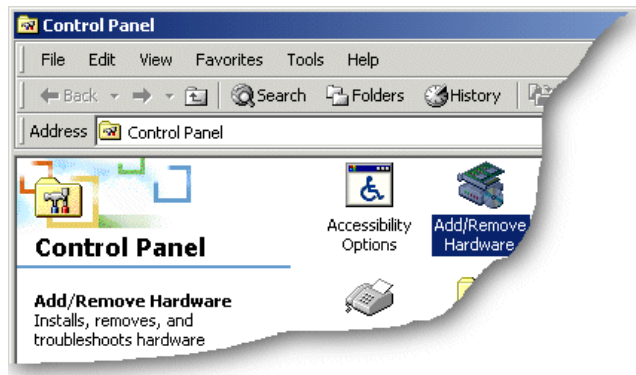
If you enable the quick close option, any data buffered in the driver will be lost.

This facility is available for both ISA and PCI host cards.

To use either of these facilities proceed as follows;

1. In the Windows 2000 desktop, click on the **Start** button and select **Settings > Control Panel**

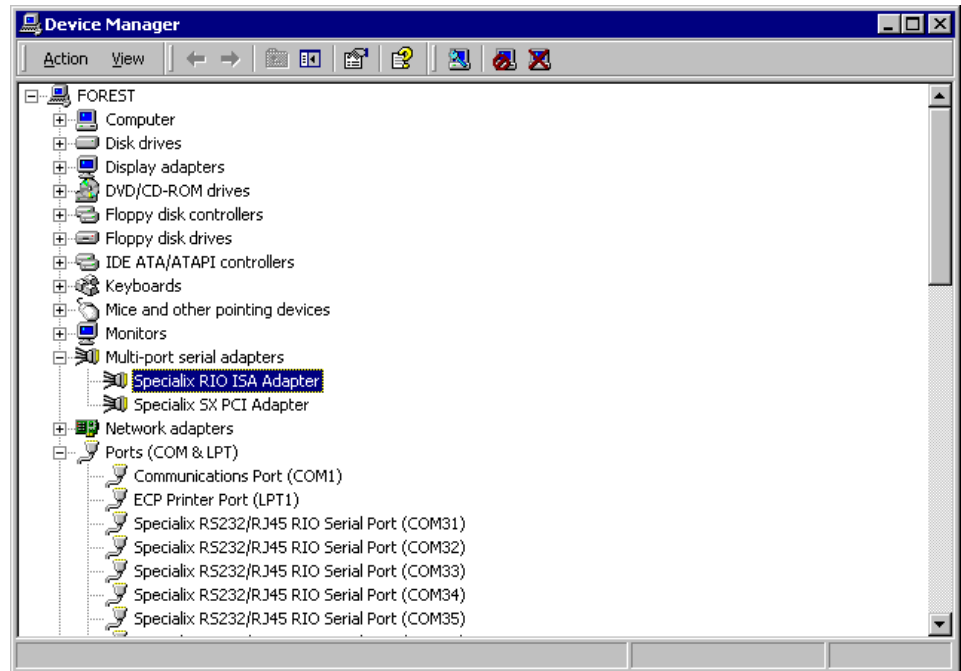
The control panel window is now displayed.



2. In the Control Panel window, click on the **System** icon.

The System Properties tabbed window is now displayed.

3. In the System Properties window, click on the **Hardware** tab.
The hardware page is now displayed.
4. In the Hardware page, click on the **Device Manager** Button.
The Device Manager window is now displayed.



5. In the Device Manager window, click on the Multi-port serial adapters icon to display the currently installed serial adapters.
6. In the Device Manager window, double click on the device whose properties you want to view or change.
The Adapter properties tabbed window is now displayed.
7. In the Adapter Properties window, click on the **Card Settings** tab to display the Card Settings page as shown in the next picture.



8. In the card settings page, click in the **Polled Mode** check box to enable or disable polled mode for the currently selected device. For information about polled mode, see [Polled mode](#) on page [120](#).

Note

This facility is **not available for ISA host cards**.

9. In the card settings page, click in the **Quick Close** check box to enable or disable the quick close facility for the currently selected device. For information about the quick close facility, see [Quick close facility](#) on page [120](#).

Removing devices and ports from the system

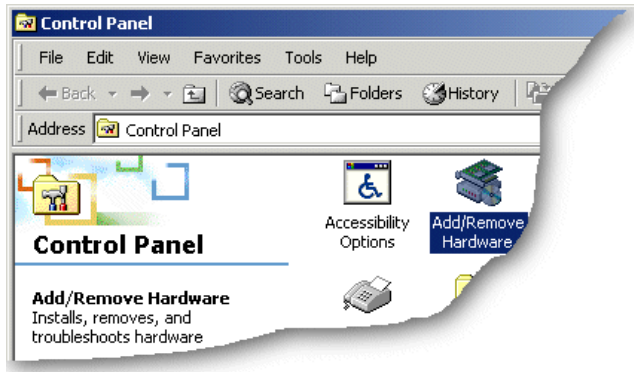
Note

To remove individual ports from your system remove their associated host cards. When you do this the connected associated ports for that device are removed automatically. No further action is required by the user.

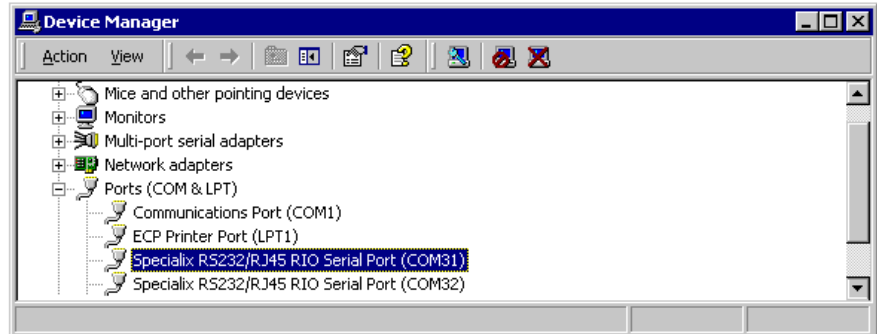
In order to remove a device such as an RTA from your RIO system you need to remove its associated host cards using the following procedure;

1. In the Windows 2000 desktop, click on the **Start** button and select **Settings > Control Panel**

The control panel window is now displayed.



2. In the Control Panel window, click on the **System** icon.
The System Properties tabbed window is now displayed.
3. In the System Properties window, click on the **Hardware** tab.
The hardware page is now displayed.
4. In the Hardware page, click on the **Device Manager** Button.
The Device Manager window is now displayed.



5. In the Device Manager window, click on the
6. In the Device manager window, display the RIO host cards associated with the RTAs you require

Note

RTAs are not displayed under Device Manager, only cards and ports.

7. In the Device Manager window, double click on the icon representing the RIO host cards associated with the RTA ports you want to remove.
The ISA adapter properties tabbed window is now displayed
8. In the Adapter Properties window, click on the **Card Settings** tab to display the Card Settings page as shown in the next picture.



9. In the card settings page, click on the RTAs you want to delete highlighting them and click on the Delete button

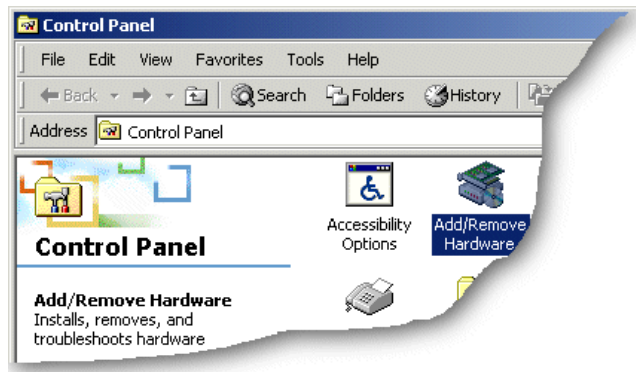
The RTA and its ports are physically deleted from the system and the window updated to reflect these changes.

Identifying RTAs

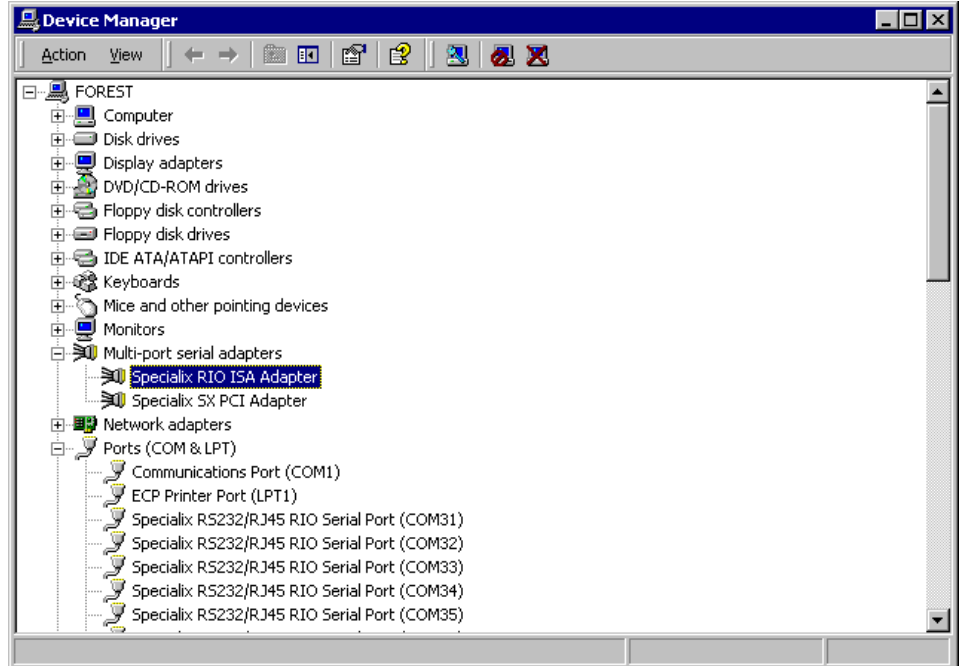
Under the Windows 2000 operating system RIO allows you to identify RTAs by flashing the LEDs on selected units. You can do this for both single and multiple RTAs. To identify and RTA in this manner proceed as follows;

1. In the Windows 2000 desktop, click on the **Start** button and select **Settings > Control Panel**

The control panel window is now displayed.



2. In the Control Panel window, click on the **System** icon.
The System Properties tabbed window is now displayed.
3. In the System Properties window, click on the **Hardware** tab.
The hardware page is now displayed.
4. In the Hardware page, click on the **Device Manager** Button.
The Device Manager window is now displayed.



5. In the Device Manager window, click on the Multi-port serial adapters icon to display the currently installed serial adaptors.
6. In the Device Manager window, double click on the device associated with the RTA(s) you wish to identify.

The Adapter properties tabbed window is now displayed.

7. In the Adapter Properties window, click on the **Card Settings** tab to display the Card Settings page as shown in the next picture.



8. In the card settings page, click on the **Identify On /Identify Off** toggle button to the **Identify On** setting.
9. In the card settings page, click on the RTAs you want to identify in the Connected RTAs list highlighting them.

The LEDS on the selected RTA(s) now flash thus identifying the unit.

Note

To stop the LEDs flashing on an RTA, simply click on an RTA in the Connected RTAs list to remove the highlight.

To disable this facility, click on the **Identify On /Identify Off** toggle button to set the **Identify Off** setting. Highlighting RTAs in the list will no longer have an effect.

Installing RIO under Linux

This section explains how to install the device driver software for the Linux operating system.

- [General installation procedure for Linux](#) on page [130](#)
- [Installing drivers onto your system](#) on page [131](#)
- [Installing utilities](#) on page [133](#)
- [Creating devices for the attached ports](#) on page [134](#)
- [Loading the driver module into the kernel](#) on page [136](#)
- [Adding ports to the system](#) on page [139](#)
- [Removing ports from a system](#) on page [141](#)

General installation procedure for Linux

The general procedure for installing and configuring host cards, drivers software and associated utilities for the Linux operating system is as follows:

Note

The RIO driver for Linux supports up to 4 host cards of either ISA or PCI bus types. Under most circumstances the driver will not need to be configured to recognise cards of either type. Once the host card has been installed and the machine has been powered on the driver will automatically find any PCI cards installed in the system and register the correct interrupt that has been assigned by the BIOS. This is a feature of PCI Plug & Play.

1. Install any PCI host cards you require into your system. See [Installing a PCI host card](#) on page [142](#).
2. Install the RIO Linux drivers onto your system using the procedures described in [Installing drivers onto your system](#) on page [131](#).
3. Install the RIO Linux utilities onto your system using the procedures described in [Installing utilities](#) on page [133](#).
4. Create devices for the required ports using the procedures detailed in [Creating devices for the attached ports](#) on page [134](#).
5. Load the driver module into the Kernel and download the firmware onto the host card and device concentrators. See [Loading the driver module into the kernel](#) on page [136](#).
6. Add or remove any ports you want to the system. See [Adding ports to the system](#) on page [139](#) and [Removing ports from a system](#) on page [141](#).
7. Install any ISA host cards you require into your system. See [Installing an ISA host card](#) on page [143](#).
8. Remove any host cards you want from your system. See [Removing host cards](#) on page [145](#).

Your system can now use the serial adaptor cards and device concentrators you have installed.

Installing drivers onto your system

To install the device driver proceed as follows:

Note

Before starting to install drivers under Linux, make sure that both a kernel patch file and utilities RPM are available.

You can find these on either of the following;

- The CDROM supplied with this product (in the drivers/rio/linux directory)
- The Perle website <http://www.perle.com>.

1. Make sure you have an up to date Linux kernel source directory installed. This can be obtained from major Linux web sites, along with instructions on how to install and build.
2. Copy the driver patch file onto your system in a temporary directory. For example, **/tmp**.
The patch file will be named
rio.patch-<driver vers>-<kernel vers>.gz
For example, **rio.patch-13-2.2.14.gz**
3. At the command prompt, uncompress the driver patch file by typing
gunzip /tmp rio.patch-13-2.2.14.gz and pressing the **Enter** key.
4. At the command prompt, change directory to the kernel source directory by typing
cd /usr/src/linux and pressing the **Enter** key.
5. At the command prompt, apply the kernel patch by typing
patch -p1 </tmp/rio.patch-13-2.2.14.gz and pressing the **Enter** key.
6. If the patch is successful, you will need to enable the driver using the **make config** or **make xconfig kernel** utility. The RIO driver appears in the **Character devices** section and is labelled **RIO system support**. Set this to **m** for modules.

Note

You will need to enable **Non-standard serial port support** in order to select the RIO Driver.

Note

Linux kernel version 2.2.15 has the RIO device driver integrated into the kernel sources. You do not need to apply a patch on this or later kernels. You only need to enable the driver (using step 6. of this procedure).

7. Now rebuild and install the kernel and modules. See your Linux distribution documentation on how to rebuild and install a new kernel and modules. We recommend reading the Kernel-HOWTO available in `/usr/doc/HOWTO`.

Note

In order to determine if any ISA cards are present, the driver will search for RIO cards at 3 **well known** ISA bus addresses (**0xC0000**, **0xD0000**, **0xE0000**). It is recommended that you leave your RIO ISA card at the factory default of **0xD0000**, as this is the most common free ISA address slot on the majority of machines. If, for some reason your ISA card cannot be left at one of these addresses then you will need to modify the sources of the driver and re-compile the rio module for inclusion into your system.

You will need to modify the following line in the `/usr/src/linux/drivers/char/rio/rio_linux.c` file:

```
int rio_probe_addrs[] = {0xc0000, 0xd0000, 0xe0000};
```

Change one of the addresses to the value you have set your ISA card rotary switches to. For example, if you have set your rotary switches to F, F (reading from left to right as you look at the switches with the ISA bus edge connector closest to you). Then you will need to set the address line to:

```
int rio_probe_addrs[] = {0xc0000, 0xd0000, 0xff0000};
```

Once you have made this change you will need to re-compile the kernel modules and install the new module on your system. See your Linux distribution documentation for details.

RIO ISA card types are always set to **polled mode**. That is, they do not use up scarce interrupt request line resources. This does not adversely affect the performance of the card or the operating system.

Installing utilities

The utilities file is named: **specialix_riotools-<maj ver>-<min ver>.i386.rpm**
For example; **specialix_riotools-4-1.i386.rpm**

To install the utilities proceed as follows:

1. Copy this file to a temporary directory and install the utilities using the following command:

```
rpm -i specialix_riotools-4-1.i386.rpm
```

The utilities are now installed in the **/usr/sbin** directory on your machine.

Note

The RIO configuration files are in the **/etc/rio** directory. A sample RIO configuration file (**rio.cf.sample**) is installed in this directory for you to use as a template.

For details about the **rio.cf** file, see [Appendix B rio.cf administration file](#).

The files **rta.bin** and **host.bin** should not be touched. These files contain the device firmware for the host card and the RTA and are loaded into the driver when the **rioboot** command is run.

Creating devices for the attached ports

After you have installed the new kernel, modules & hardware, and have rebooted the machine. The following procedure can be followed to create devices for the attached ports.

1. At the command prompt, load the RIO driver module by typing **modprobe rio** and pressing the **Enter** key.
2. Verify the module has successfully loaded using the **lsmod** command. The output should contain references to the rio module.
3. Ensure all your RIO devices are attached and powered on.
4. At the command prompt, upload the host card firmware to the driver and boot the attached devices (ignore any warning or error messages) by typing:
rioboot -f and pressing the **Enter** key.
5. At the command prompt, create a configuration file (/etc/rio/rio.cf) based on what is attached to your system by typing:
rioboot -w > /etc/rio/rio.cf.new and pressing the **Enter** key

The contents of the rio.cf file is now displayed as shown in the next example;

```
HOST:d100000f::boot:
RTA:9400073d: UNKNOWN RTA 1-1:-1:boot:
RTA:94000731: UNKNOWN RTA 1-2:-1:boot:
RTA:94000732: UNKNOWN RTA 1-3:-1:boot:
RTA:94000733: UNKNOWN RTA 1-4:-1:boot:
```

6. Using a suitable text editor, modify the new configuration file (/etc/rio/rio.cf.new) to give your RTA's names and assign ports to them as shown in the next example;

```
HOST:d100000f::boot:
RTA:9400073d: RTA16 0-15:0:boot:
RTA:94000731: RTA16 16-31:16:boot:
RTA:94000732: RTA16 32-47:32:boot:
RTA:94000733: RTA16 48-63:48:boot:
```

7. Rename the new configuration file you have created to **/etc/rio/rio.cf**
8. At the command prompt, upload the changes to the driver by typing **rioboot -u** and pressing the **Enter** key.
9. At the command prompt, create device nodes for the attached RTA's by typing **riomkdev** and pressing the **Enter** key.

10. Your system now has a number of device nodes (/dev/ttySR*) relating to the ports on the attached RTA's.

Note

When you have installed Remote Terminal Adaptors under Linux, you need to do the following after powering up the system;

- a. Wait for the machine to boot,
- b. Login as root
- c. Run **riomkdev -f** to create new port devices in the /dev directory.

Loading the driver module into the kernel

In order to make use of the RIO devices, you must load the driver module into the Kernel and then download the firmware onto the host card and RTA devices. You can do this manually every time the machine boots. Alternatively you can configure the start-up files to ensure the driver is always loaded and initialised when the machine boots. See the following for details;

- [Manually loading the module and firmware](#) on page **136**
- [Loading the RIO module and firmware automatically](#) on page **137**

Manually loading the module and firmware

To manually load the module and firmware follow the steps below:

1. At the command prompt, load the RIO module into the kernel by typing **modprobe rio** and pressing the **Enter** key.
2. At the command prompt, load the RIO firmware into the driver by typing **rioboot** and pressing the **Enter** key.

The RTA's now boot and connection messages are displayed on the console.

Loading the RIO module and firmware automatically

1. To automatically configure the start up files to load the rio module and firmware, copy the following script to the file `/etc/rc.d/init.d/rio`.

```
#!/bin/sh
#
# rio          This shell script takes care of starting and stopping
#              the RIO services.
#
# probe: true

# Source function library.
. /etc/rc.d/init.d/functions

#
# Exit if the rio utilities are not present
#
[ -f /usr/sbin/rioboot ] || exit 0

# See how we were called.
case "$1" in
  start)
    # Start driver and load module.
    action "Starting RIO services: " /sbin/modprobe rio
    echo -n "Starting RIO Firmware: "
    #
    # If we have a rio.cf file then just rioboot
    #
    if [ -f /etc/rio/rio.cf ]; then
      daemon /usr/sbin/rioboot
    else
      daemon /usr/sbin/rioboot -f
    fi
    echo
    ;;
  stop)
    # Stop driver and unload module.
    action "Shutting down RIO services: " /sbin/modprobe -r rio
    echo
    ;;
  status)
    status rio
    ;;
  restart|reload)
    $0 stop
    $0 start
    ;;
  *)
    echo "Usage: rio {start|stop|restart|reload|status}"
    exit 1
esac

exit
```

2. Create symbolic links to the file in the relevant system start-up directories ([page 138](#)).

Creating symbolic links

If your machine normally boots into run level 5 you will need to create the following symbolic links:

```
ln -s /etc/rc.d/init.d/rrio /etc/rc.d/rc5.d/S50rrio
```

```
ln -s /etc/rc.d/init.d/rrio /etc/rc.d/rc5.d/K50rrio
```

These links will ensure that the RIO start-up script **S50rrio** is run each time the machine is booted into run level 5 and that the kill script **K50rrio** is run whenever the machine is shutdown.

Adding ports to the system

You can add more ports, in the form of extra RTA devices, to a live system following the guidelines below.

1. Attach the new RTA to the RIO network via its link cable and power the unit on. See [Installing Remote Terminal Adaptors \(RTAs\)](#) on page 146.
2. Wait until the unit has booted (indicated by the **RUN** and **CON** LEDs being on).
3. At the command prompt, write out the current device driver configuration: by typing **rioboot -w >/etc/rio/rio.cf.new** and pressing the **Enter** key.

Modify the configuration file to give the new RTA (the one named "UNKNOWN RTA...") a name and allocate a starting port number to the device as shown in the next example: The contents of the rio.cf file is now displayed as shown in the next example;

Before modification

```
HOST:d100000f: RIO PCI 1: boot:
    RTA:9400073d:RTA16 Ports 0-15:0:boot:
    RTA:94000731:RTA16 Ports 16-31:16:boot:
    RTA:94000732:UNKNOWN RTA 1-3:-1:boot:
```

After modification

```
HOST:d100000f:RIO PCI 1:boot:
    RTA:9400073d:RTA16 Ports 0-15:0:boot:
    RTA:94000731:RTA16 Ports 16-31:16:boot:
    RTA:94000732:RTA16 Ports 32-47:32:boot:
```

Here the new "UNKNOWNRTA" has been assigned a name "RTA16 Ports 32-47" and allocated a starting port number of 32.

4. At the command prompt, syntax check the new configuration file by typing **rioboot -s -c /etc/rio/rio.cf.new** and pressing the **Enter** key.
5. Fix any errors indicated by the syntax check and then rename the configuration file to **/etc/rio/rio.cf**
6. At the command prompt, upload the changes to the driver by typing **rioboot -u** and pressing the **Enter** key.
7. At the command prompt, create device nodes for the attached RTA's by typing **riomkdev** and pressing the **Enter** key.

Your system now has a number of new device nodes (/dev/ttySR*) relating to the ports on the new RTA.

Note

To check that the port is present and available, type **stty -a </dev/ttySR32** at the command prompt and press the **Enter** key.

The port name can be determined by the RTA offset in the rio.cf file ([page 164](#)) added to the port offset on the RTA i.e. the 4th port on RTA "RTA16 Ports 16-31" is 16 + 4 or /dev/ttySR20.

Removing ports from a system

You can remove groups of ports from a live system using the following procedure:

1. Determine the name and/or unique number of the RTA you wish to remove from the system.

Hint

You can do this disconnecting the RTA link and getting its name from the console messages that occur when an RTA is disconnected from the network. Alternatively, use the **rioidentify** command to determine which RTA/name needs to be removed.

2. Power off and detach an RTA from the RIO network. See [Removing a Remote Terminal Adaptor \(RTA\)](#) on page 158
3. At the command prompt, delete the RTA entry from the device driver by typing **riodelete <unique number|"name">** and pressing the **Enter** key.
4. Using a suitable text editor, edit the **/etc/rio/rio.cf** file to remove the RTA you have just powered off. Remove the RTA line that contains the unique number and/or name of the RTA just deleted.
5. At the command prompt, syntax check the new configuration file and fix any errors by typing **rioboot -s -c /etc/rio/rio.cf** and pressing the **Enter** key.
6. At the command prompt, upload the changes to the driver by typing **rioboot -u** and pressing the **Enter** key.
7. At the command prompt, delete the device nodes from the **/dev** directory by typing **riomkdev -d <unique number|"name">** and pressing the **Enter** key.

Installing a PCI host card

To install a PCI host card proceed as follows;

Note

The exact location of host card slots varies for different systems, for exact mechanical details of your system, refer to your system documentation.



Warning

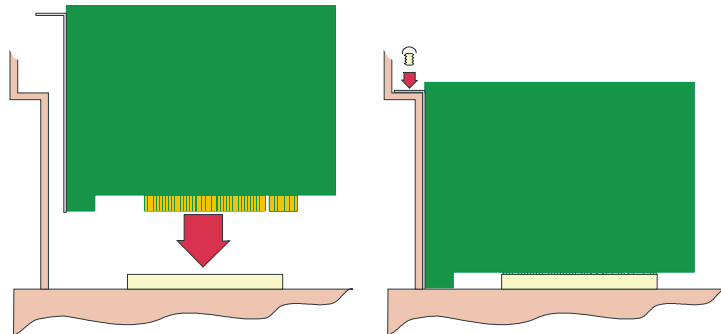
Dangerous voltages exist inside computer systems. Before installing host cards in your system, turn off the power supply and disconnect the mains lead.

1. Turn off the power to your system and disconnect the mains supply.
2. Remove the system cover to expose the inside of the connector panel for host cards.
3. Insert the PCI card you want to install into a vacant host card slot and secure in place as shown in the next picture.



Caution

Full anti-static precautions should be taken when handling host cards.



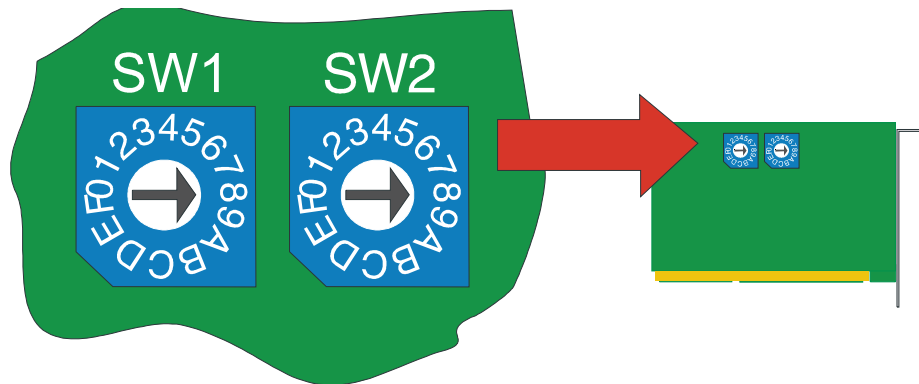
4. Repeat step 3. until you have installed all the PCI cards you want.
5. Replace and secure the system cover.

Installation of PCI host cards is now complete. For further details about installing host cards including other types, see [Before you start](#) on page 31.

Installing an ISA host card

Setting the address on an ISA host card

Before you install an ISA card in your system you need to physically set the address for the card using the two rotary switches **SW1** and **SW2** provided on the host card (shown in the next picture).



To set the address for an ISA host card proceed as follows;



Caution

Full anti-static precautions should be taken when handling host cards.

1. Choose an address you want to use for the host card in hexadecimal.
2. On the host card, set the two rotary switches **SW1** and **SW2** to the first two digits of the address you want as shown by the next example.

Host card Address	Set SW1 to..	Set SW2 to..
0D0000 (factory setting)	0	D
F00000	F	0

Mechanical installation

You can now install the ISA host card in your system. To do this proceed as follows;

Note

The exact location of host card slots varies for different systems, for exact mechanical details of your system, refer to your system documentation.



Warning

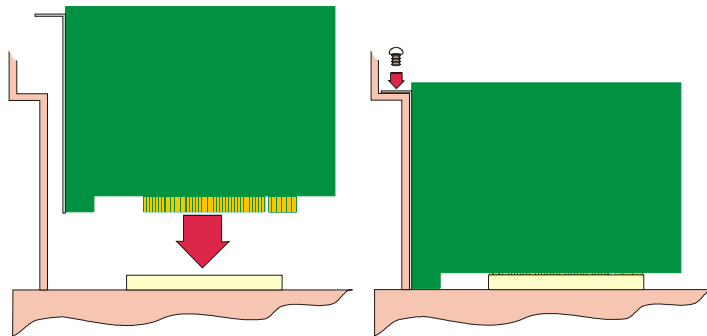
Dangerous voltages exist inside computer systems. Before installing host cards in your system, turn off the power supply and disconnect the mains lead.

3. Turn off the power to your system and disconnect the mains supply.
4. Remove the system cover to expose the inside of the connector panel for host cards.
5. Insert the ISA card you want to install into a vacant host card slot and secure in place as shown in the next picture.



Caution

Full anti-static precautions should be taken when handling host cards.



6. Repeat step 3. until you have installed all the ISA cards you want.
7. Replace and secure the system cover.
8. Plug in the mains lead and turn on the power.

Installation of ISA host cards is now complete. For further details about installing host cards including other types, see [Before you start](#) on page 31.

Removing host cards

To remove a host card from your system proceed as follows;

Note

The exact location of host card slots varies for different systems, for exact mechanical details of your system, refer to your system documentation.



Warning

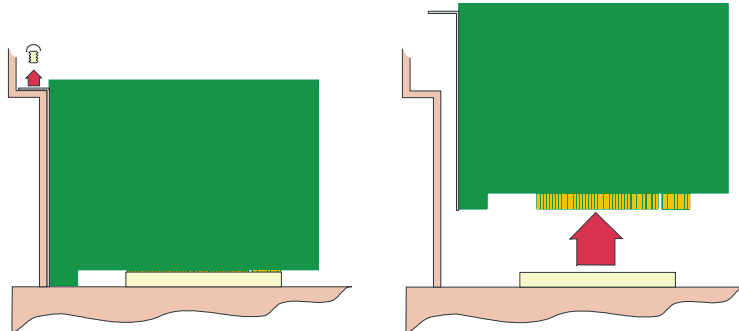
Dangerous voltages exist inside computer systems. Before removing host cards from your system, turn off the power supply and disconnect the mains lead.

1. Turn off the power to your system and disconnect the mains supply.
2. Remove the system cover to expose the inside of the connector panel for host cards.
3. Remove all cables plugged into the host card.
4. Undo the securing screw for the host card you want to remove then lift the card out of its slot as shown in the next picture (ISA card shown).



Caution

Full anti-static precautions should be taken when handling host cards.



5. Repeat step 4. until you have removed all the host cards you want.
6. Replace and secure the system cover.
7. Plug in the mains lead and turn on the power.

Removal of host cards is now complete. For further details about installation of host cards including other types, see [Before you start](#) on page 31.

Installing Remote Terminal Adaptors (RTAs)

Remote Terminal Adaptors (RTAs) are serial connection blocks which provide a number of ports depending on type. RTAs come in three main varieties, the RTA 8 (providing 8 ports) and RTA 16 and RRC16 (providing 16 ports). Each type of RTA is available in a number of variations see [Remote Terminal Adaptors](#) on page [22](#) in [Chapter 1 Introduction](#).

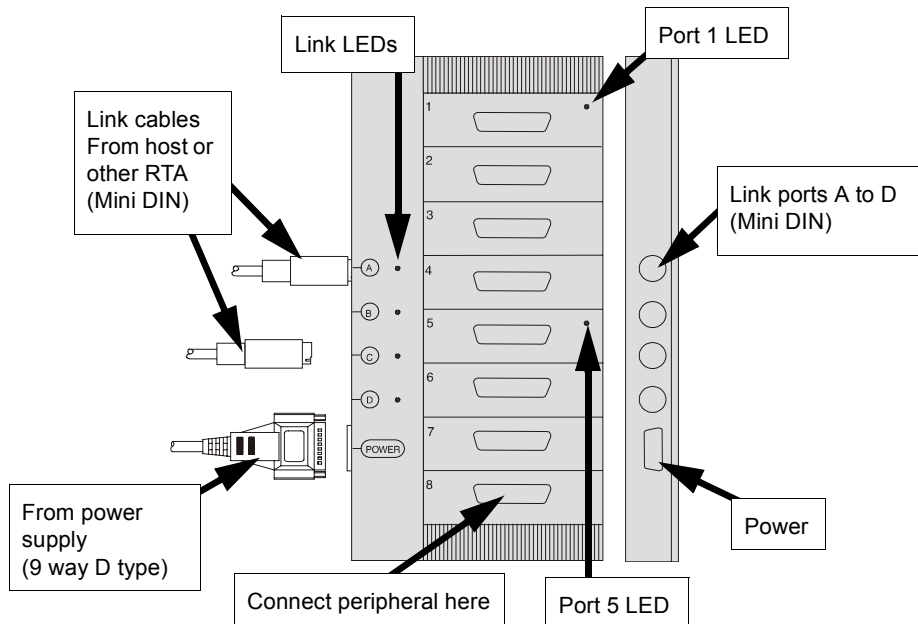
The installation procedure for each main type is given in the following sections;

- [RTA8 8 port Remote Terminal Adaptors](#) on page [147](#)
- [RTA16 16 port Remote Terminal Adaptors](#) on page [150](#)
- [RRC16 Remote Concentrator](#) on page [153](#).

RTA8 8 port Remote Terminal Adaptors

Installation procedure

To install an RTA8 proceed as follows;



1. If required, wall mount the unit using the procedures described in [Wall mounting an RTA8](#) on page 149.
2. Connect the link cables from the host card or other RTA to your RTA8 into the link socket of your choice.
3. Take an RT8 power supply unit and making sure that the mains is disconnected, connect the 9 way D type connector from the power supply to the RTA unit.



Warning

When using multiple RTA power supplies, do not stack the units as this may cause overheating.

4. Plug a suitable mains lead into the power supply unit, then connect the other end of the cable to the mains and turn on the power.

The RTA8 unit will now boot up, then commence normal operation. The LEDs on the unit will display different colours depending on the RTA state as shown in the next table.

RTA state	Link LEDs	Port 1 LED	Port 2 LED
Switched off	Off	Off	Off
Being booted up by host	Orange	Off	Off
Boot up successfully completed	Orange	Green	Off
Assigned ID by host	Orange	Green	Green
Traffic on Link	Green	Green	Green
Error on link	Flashing Red	Green	Green
Isolated from host	Red for 20 seconds then off	Green	Off

Note

If the LEDs on the unit do not display as expected, refer to [Appendix C Troubleshooting](#) for details of corrective action to take.

Wall mounting an RTA8

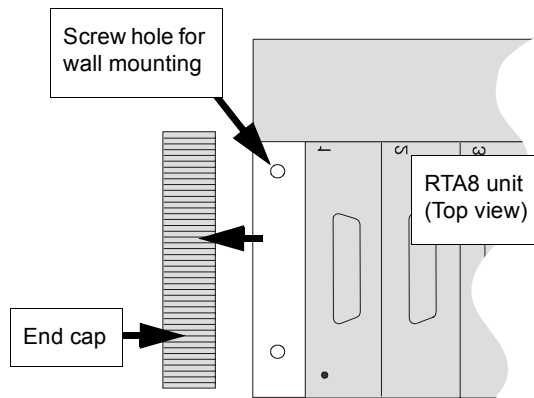
The RTA8 has is fitted with wall mounting holes at either end of the unit concealed by push-fit end caps. To wall mount a RTA8 unit proceed as follows;



Warning

Before you wall mount the RTA, turn off and disconnect the power supply to the unit.

1. On the RTA unit gently prize off the caps at either end of the unit to reveal the wall mounting holes as shown in the next picture.



2. Screw the unit to the wall through the holes provided using appropriate screws or fasteners for your installation.
3. Replace the caps at the ends of the unit.

Wall mounting of the unit is now complete. You can now perform the normal installation steps described in [RTA8 8 port Remote Terminal Adaptors](#) on page 147.

RTA16 16 port Remote Terminal Adaptors

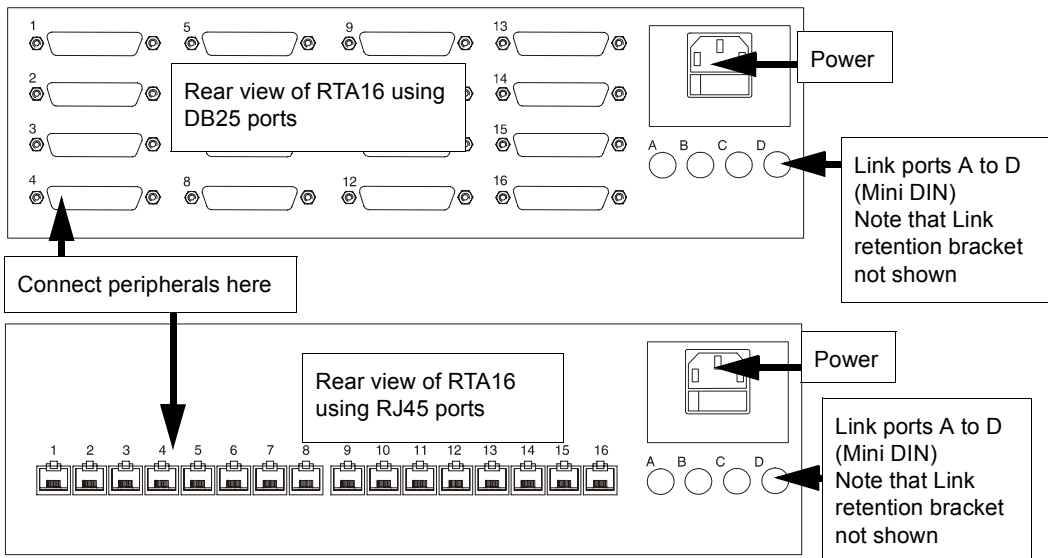
Installation procedure

To install an RTA16 proceed as follows;



Warning

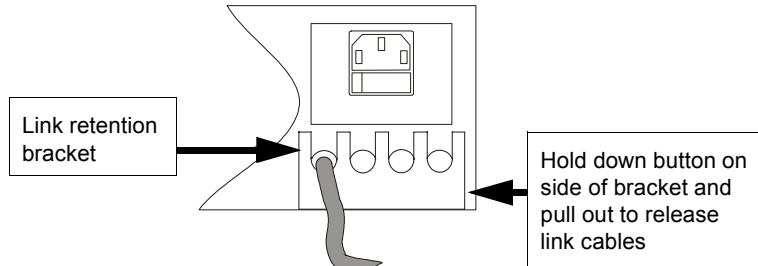
When using multiple RTA16s, do not stack the units more than four high as this may cause overheating.



1. Connect the link cables from the host card or other RTA to your RTA16 into the link socket of your choice.

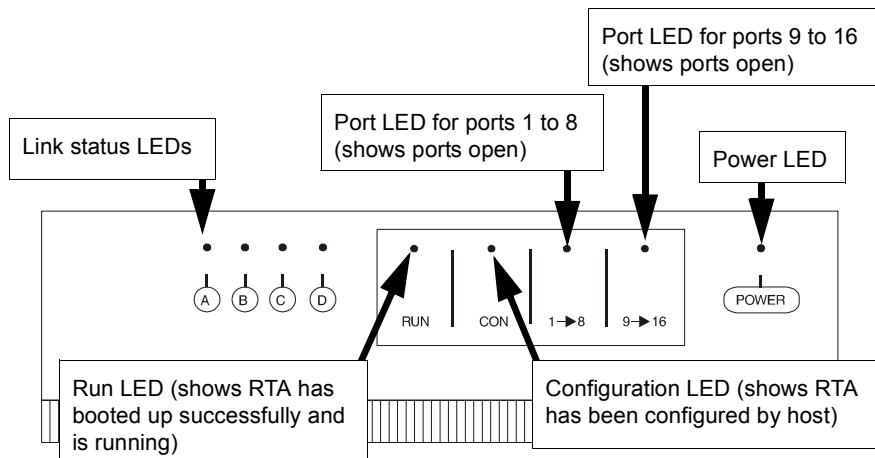
Hint

To prevent accidental removal of link cables, fit the link retention bracket supplied with the unit as shown in the next picture.



2. Connect a the power lead into the socket at the rear of the RTA unit, turn on the supply and finally turn on the power switch at the rear of the unit.

The RTA16 unit will now boot up, then commence normal operation.



The LEDs on the unit will display different colours depending on the RTA state as shown in the next table.

LED states

RTA state	Link LEDs	RUN LED	CON LED	PORT
Switched off	Off	Off	Off	Off
Being booted up by host	Orange	Off	Off	Off
Boot up successfully completed	Orange	Green	Off	Off
Assigned ID by host	Orange	Green	Green	Off
Traffic on Link	Green	Green	Green	Off
Error on link	Flashing Red	Green	Green	Off
Isolated from host	Red for 20 seconds then Off	Green	Off	Off
Port open	No change	No change	No change	Green

Note

If the LEDs on the unit do not display as expected, refer to [Appendix C Troubleshooting](#) for details of corrective action to take.

RRC16 Remote Concentrator

Installation procedure

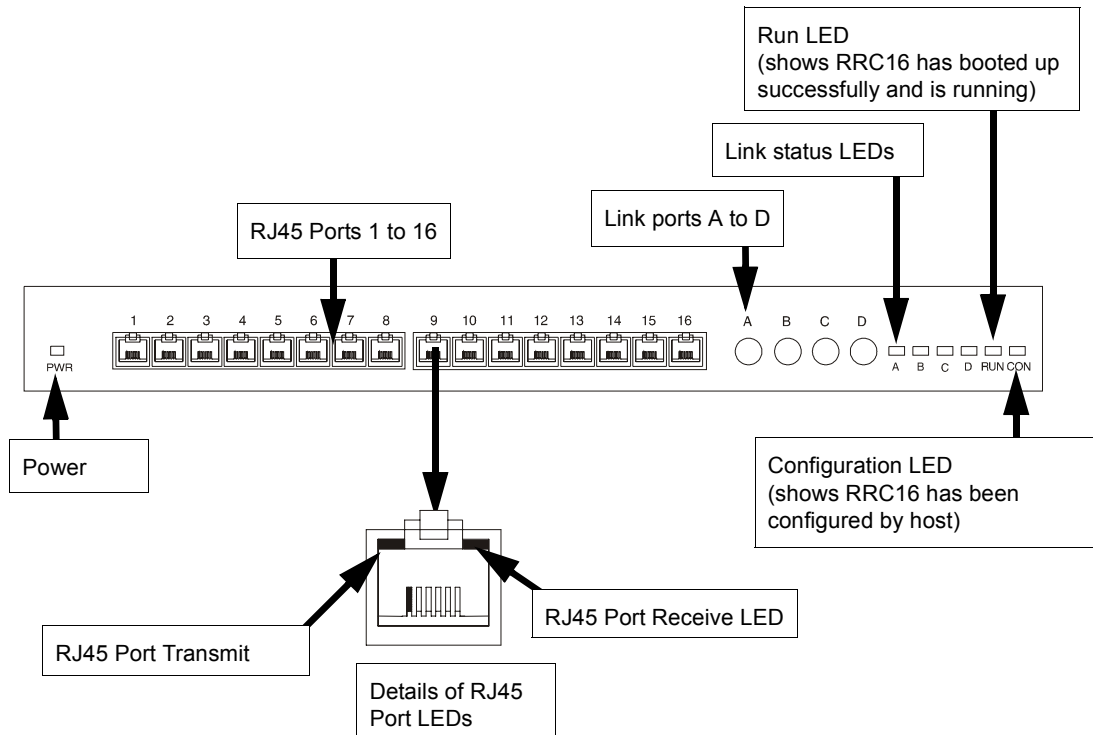
To install an RRC16 proceed as follows;



Warning

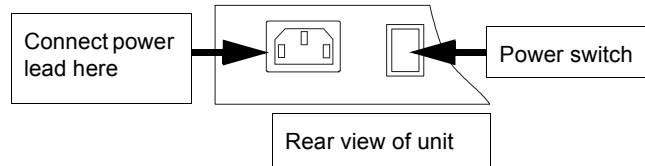
When using multiple RRC16s, first fit the rubber mounting feet supplied with each unit (see [page 155](#)), and do not stack the units more than four high as this may cause overheating.

1. Mount the unit depending on the type of installation you require. For example, rack mounted, wall mounted and so on. See [Mounting the RRC16](#) on [page 155](#) for details.



2. Connect the link cables from the host card or other RTA to your RRC16 into the link socket of your choice.

3. Connect a power lead into the socket at the rear of the RTA unit, turn on the supply and also the power switch at the rear of the RRC unit.



The RRC16 unit will now boot up, then commence normal operation. The LEDs on the unit will display different colours depending on the state of the unit as shown in the next table.

RRC state	Link Status LEDs	RUN LED	CON LED	RJ45 port transmit	RJ45 port receive
Switched off	Off	Off	Off	No change	No change
Being booted up by host	Orange	Off	Off	No change	No change
Boot up successfully completed	Orange	Green	Off	No change	No change
Assigned ID by host	Orange	Green	Green	No change	No change
Traffic on Link	Green	Green	Green	No change	No change
Error on link	Flashing Red	Green	Green	No change	No change
Isolated from host	Red for 20 seconds then Off	Green	Off	No change	No change
Port open	No change	No change	No change	No change	No change
RJ45 port transmitting data	Green	Green	Green	Yellow	Off
RJ45 port receiving data	Green	Green	Green	Off	Green

Note

If the LEDs on the unit do not display as expected, refer to [Appendix C Troubleshooting](#) for details of corrective action to take.

Mounting the RRC16

You can mount the RRC16 unit in a number of ways. See the following for details;



Warning

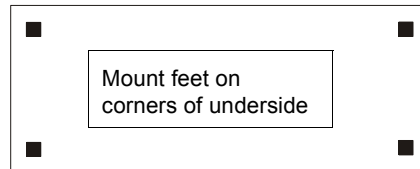
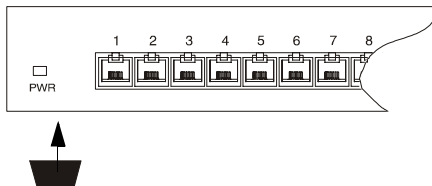
When using multiple RRC16s, first fit the rubber mounting feet supplied with each unit (see [page 155](#)), and do not stack the units more than four high as this may cause overheating.

- [Mounting on a flat surface](#) on page [155](#)
- [Rack mounting](#) on page [156](#)
- [Rack mounting](#) on page [156](#)

Mounting on a flat surface

To mount an RRC16 on a flat surface proceed as follows;

1. Take the RRC16 and fix one of the self adhesive rubber mounting feet provided with the unit on each corner of the underside as shown in the next picture.

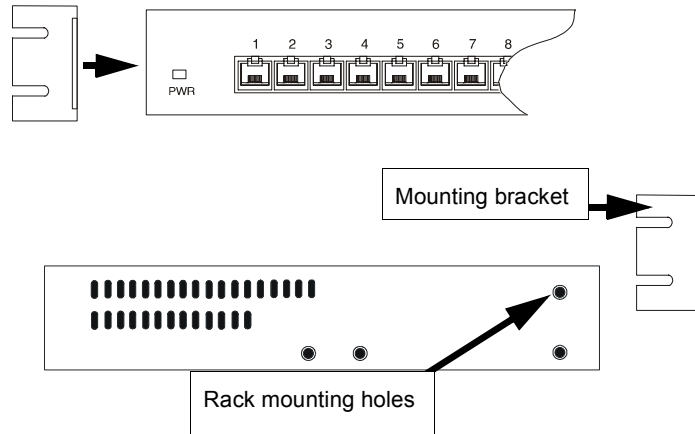


2. Install and cable up the unit using the procedure described in [RRC16 Remote Concentrator](#) on page [153](#).

Rack mounting

To rack mount an RRC16 proceed as follows;

1. Take the RRC16 and screw one of the mounting brackets provided with the unit into each side of the unit as shown in the next picture.

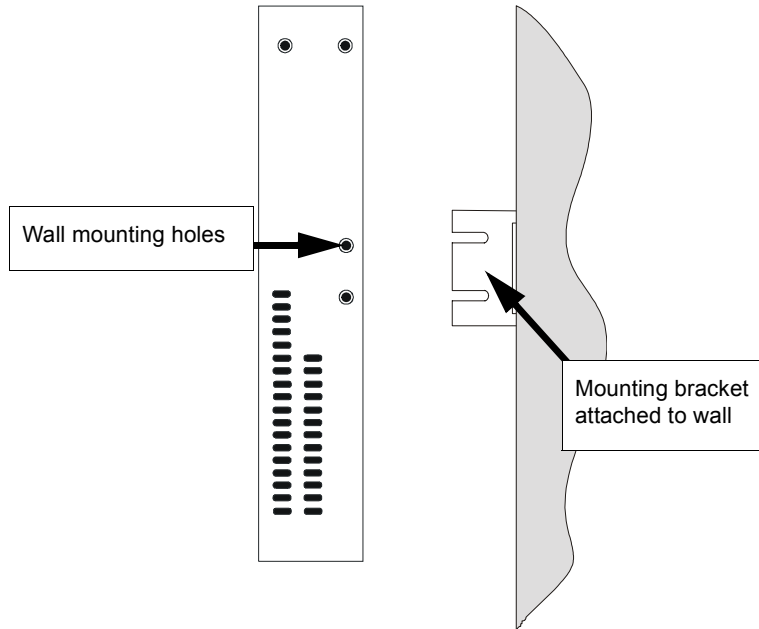


2. Insert the unit into your rack frame and secure in place.
3. Install and cable up the unit using the procedure described in [RRC16 Remote Concentrator](#) on page [153](#).

Wall mounting

To wall mount an RRC16 proceed as follows;

1. Take the RRC16 and screw one of the mounting brackets provided with the unit into each side of the unit as shown in the next picture.
2. Secure the unit to the wall via the brackets and using suitable fasteners for the type of wall you are fixing to.



3. Install and cable up the unit using the procedure described in [RRC16 Remote Concentrator](#) on page [153](#).

Removing a Remote Terminal Adaptor (RTA)

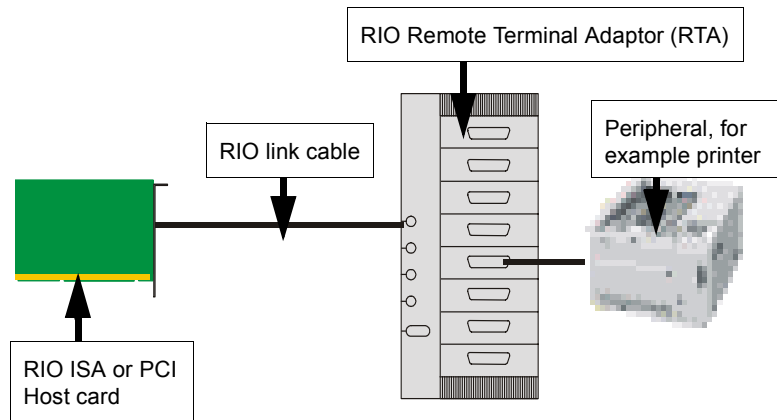
To remove an RTA from your RIO system proceed as follows;

1. Turn off the power to the RTA you want to remove and disconnect the power lead from the unit
2. Disconnect the link cables from the unit
3. Disconnect any peripheral cables from the unit, for example printer, terminal and so on.
4. Update to your system for the revised configuration. The exact procedure for this will depend on the operating system, see the following for details;

Operating system	For updating the system, see
Solaris	Updating your RIO system configuration on page 49 .
SCO UnixWare	Removing an RTA from the system on page 83 .

Installing a short distance link

For short distances up to 75 metres you can use the RIO link cable to make up a basic RIO system as shown in the next picture. Typically, you use this type of system when you want to connect peripherals to the host within the same building.



To install a short distance link proceed as follows;

1. Take one end of a RIO link cable and plug it into the host card mini DIN socket of your choice. See [Link Cable](#) on page 204 of [Chapter 3 RIO Cabling information](#).
2. Install the RTA as described in [Installing Remote Terminal Adaptors \(RTAs\)](#) on page 146.
3. Take the other end of the RIO link cable and plug it into the RTA link port. See [Installing Remote Terminal Adaptors \(RTAs\)](#) on page 146.
4. Connect the peripheral to the RTA using a suitable cable. See [Chapter 3 RIO Cabling information](#).

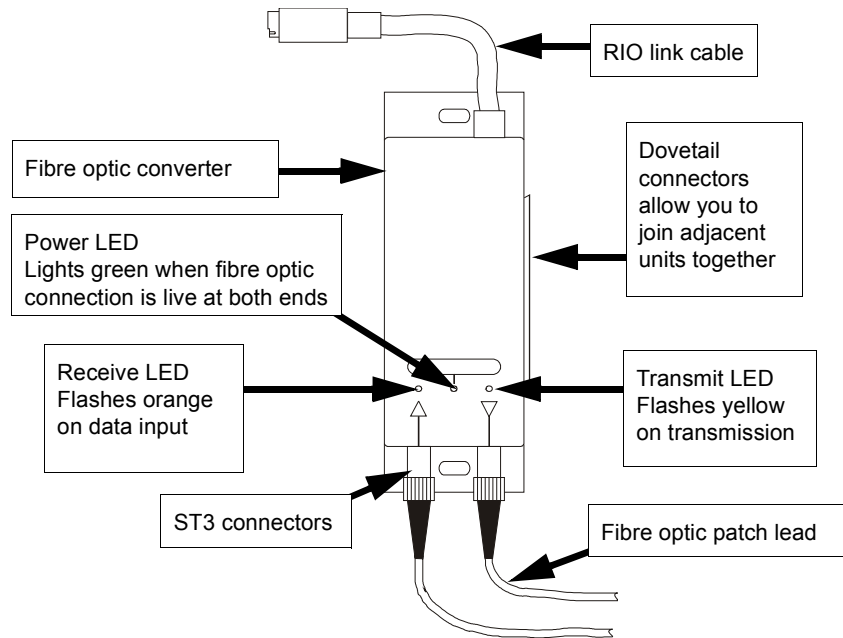
You can now continue with the rest of the general installation procedure for your operating system.

Installing a Fibre Optic Link Kit (FOLK)

Introduction

The RIO Fibre Optic Link Kit allows you to extend the range of a RIO link via fibre optic cable to a distance of up to one kilometre. The kit comprises two fibre optic modules. A module is shown in the next picture. Each module consists of a 1 metre long RIO link cable connected to a fibre optic converter. This converts the transputer signals into light. The fibre optic cable plugs into one of these converters at each end.

Fibre optic unit main components



For information on how to install this unit, see [Installation procedure](#) on page 161.

Installation procedure

To install the fibre optic unit proceed as follows;

Note

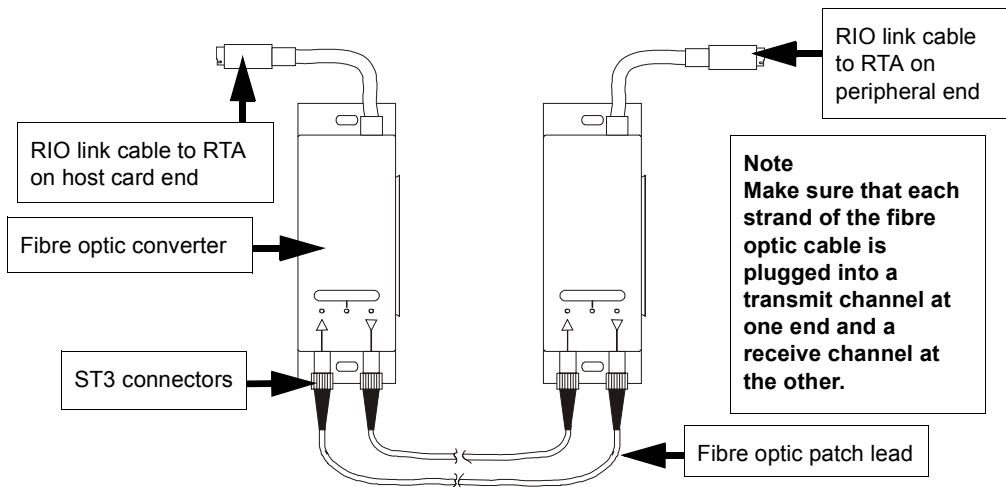
The fibre optic cable used with the FOLK unit is usually part of an existing fibre optic installation. Typically the fibre optic cable is wired into a junction box, and should then emerge in the form of a patch lead with two bayonet connectors at each end.

1. On each fibre optic converter, remove the dust caps from the ST3 sockets.

Hint

You should keep the dust caps safe and replace them if you remove the patch lead at any time as dirt on fibre optic connections can corrupt the signal.

2. Take one end of the fibre optic patch lead and plug the bayonet connectors into the ST3 sockets on the fibre optic converter you want to connect to.



3. Plug the RIO link cable into on the fibre optic converter into one of the link sockets on the the RTA.
4. Repeat steps 2. to 3. using the other end of the fibre-optic cable and the other FOLK unit
5. Check that the Connect LED on each fibre optic module is green when the host card or RTA at each end are powered up.

Installing a Long Distance Module (LDM)

Introduction

The RIO Long Distance Module (LDM) allows you to extend your RIO system via a leased line. Using a RIO Long Distance Module you can make connections can over thousands of miles using synchronous (X.21/X.21bis) or asynchronous interfaces.

Note

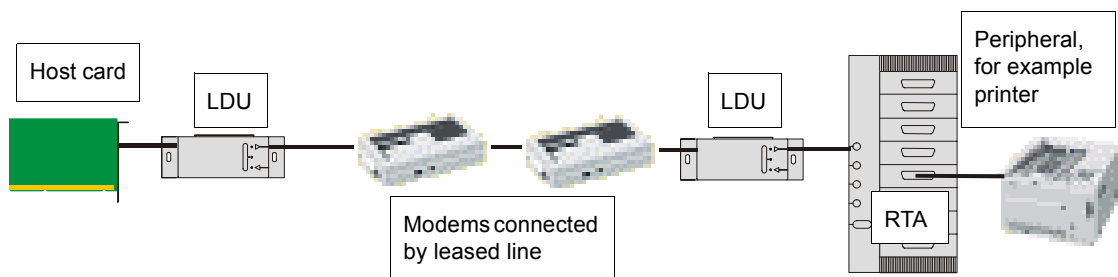
The LDM is specifically designed for use on high-speed synchronous connections. Slower, asynchronous speeds are supported but are only recommended for applications where low throughput is acceptable.

You can increase the number of RTAs on the remote site using standard RIO cables, making the LDM more cost-effective and more practical than a multiplexer.

The LDM consists of two Long Distance Units (LDUs). Each unit comprises a converter box with flying leads as shown in [Long Distance Unit main components](#) on page 163. One LDU connects your local host card or RTA to a modem, the other connects the remote RTA to a modem. You can configure the speed and protocol using a dial on the LDU.

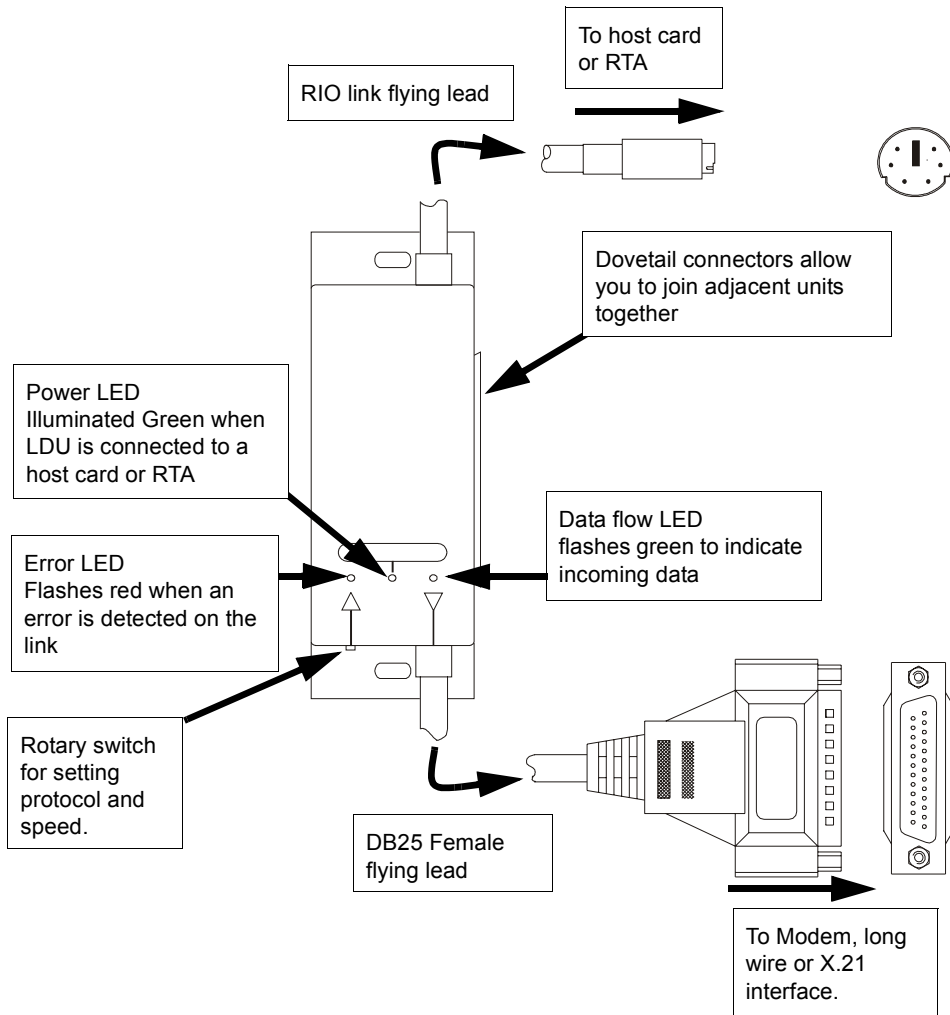
The LDM also supports twisted-pair RS422 cable up to a distance of 1km. This may provide a more cost-effective solution than the RIO Fibre Optic Link Kit in environments with low interference levels or a low security risk. Alternatively, it could be used to provide fault tolerant links for a fibre optic link based system.

A typical remote system is shown in the next picture.



Long Distance Unit main components

The RIO Long Distance Unit (LDU) consists of a converter box with two flying leads. One is a metre-long RIO Link cable which plugs into your host card or RTA; the other is a serial cable with a DB25 connector which connects to your modem or RS422 long-wire cable.



Installation

Note

For modem installations, you need to use a converter cable to connect the LDU DB25 flying lead to the modem. On long-wire installations, the long-wire you can connect directly to the DB25 flying lead.

For information on how to wire up the converters needed for each type of installation see [Adaptor pinouts for LDU flying lead connectors](#) on page 171.

General procedure

To install a long distance module proceed as follows;

1. On the LDU, set the speed and protocol you want by setting the rotary switch on each LDU (shown on [page 163](#)) using a small screwdriver. The settings available are shown in the next table.

Device	Line Speed	Transmission type	Use switch setting
Modem	9600	Asynchronous	0
Modem	19200	Asynchronous	1
Modem	38400	Asynchronous	2
Reserved address, do not use			3
Reserved address, do not use			4
Long wire	78000	Asynchronous	5
Long wire	156250	Asynchronous	6
Long wire	312500	Asynchronous	7
Modem		Synchronous	8
X21 bis		Synchronous	9
X21		Synchronous	A
Reserved address, do not use			B
Modem with Autodial	9600	Asynchronous	C
Modem with Autodial	19200	Asynchronous	D
Modem with Autodial	38400	Asynchronous	E
Reserved address, do not use			F

2. Install the type of LDU link you want. For Modem via telephone line see [page 165](#), for long wire see [page 165](#) and for X.21 see [page 165](#).

Installing a long distance LDM link via Modem and leased line

To install a long distance LDM link via modem and leased line proceed as follows;

Note

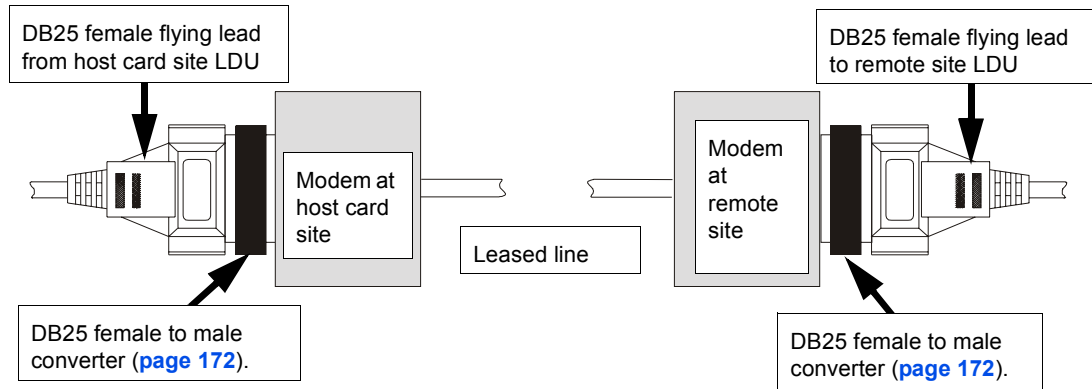
The modem you use for this type of installation should have an autodial facility. That is the ability to pre-configure the unit to dial a specified number upon powering up.

1. Follow the procedure given in given in [Installation](#) on page [164](#).
2. Connect the modem which you use for the host card site to a PC and configure as follows;
 - a. Set the autodial number you want using the AT command set. See modem user documentation for details.
 - b. Configure the modem as shown in the next table;

Mode	Parameter	Setting
Synchronous	Minimum speed	14.4 Kbit/s
	Maximum speed	64Kbit/s
	Port setting	8 data bits
	Flow control	Disabled
	Command echo	Disabled
	Display of result codes	Suppressed
Asynchronous	Specification	V32bis minimum
	Minimum speed	Modems must connect at a minimum of 9600 baud
	Port settings	8 data bits, 1 stop bit and no parity
	Hardware flow control	Enabled
	Command echo	Disabled
	Display of result codes	Suppressed

- c. Save the settings you have chosen.
 - d. Turn off the power to the modem and remove the power and PC connections.
3. Connect the modem which you use for the remote site to a PC and set the modem to auto answer mode. See modem user documentation for details.
4. Configure the general modem settings to the same values as the host cards site modem as step [2.](#), sub step [b.](#) previously.
5. Save the settings you have chosen.
6. Turn off the power to the modem and remove the power and PC connections.

7. At the host card site, connect an LDU to a modem using the DB25 female flying lead on the LDU via a DB25 female to male adaptor as shown in the next picture.
8. At the remote site, repeat step 7. to connect the LDU and so forth.

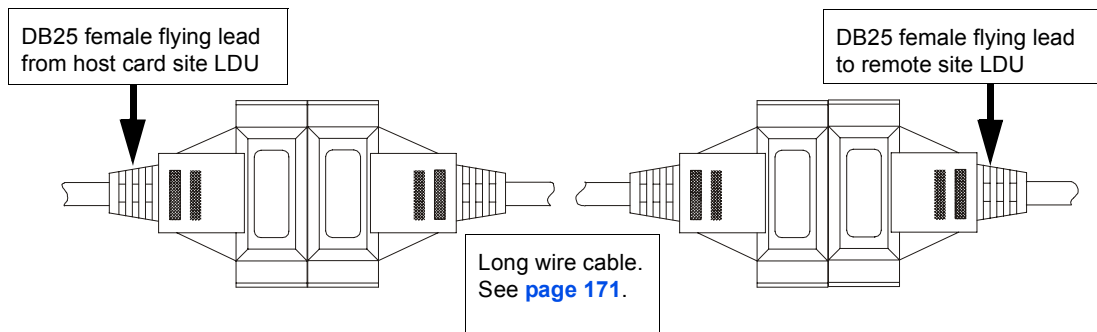


9. At both the host card and remote sites, connect each LDU to any free Link socket on the associated RTA using the RIO Link flying lead.
10. At each site, ensure the modems are connected to the required telephone line.
11. When the Host Card and RTAs at each end of the LDM connection are powered up, check that the Power LED on each LDU is green (see [page 163](#)).

Long wire installation

To install a long distance LDM link via long wire proceed as follows;

1. Follow the procedure given in given in [Installation](#) on page [164](#).
2. At the host card site, connect an LDU to one end of a long wire cable using the DB25 female flying lead on the LDU as shown in the next picture.
3. At the remote site, repeat step [2](#). to connect the LDU and so forth.

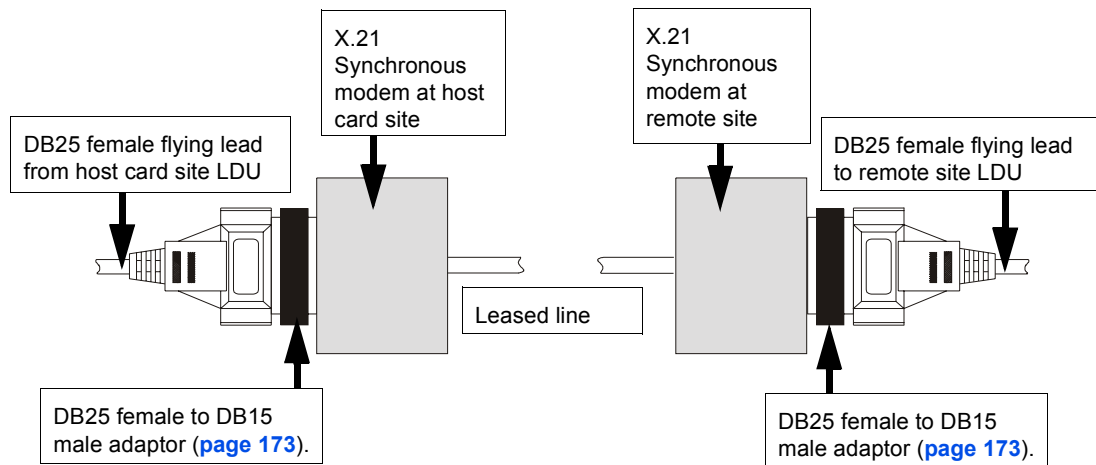


4. At both the host card and remote sites, connect each LDU to any free Link socket on the associated RTA using the RIO Link flying lead.
5. When the Host Card and RTAs at each end of the LDM connection are powered up, check that the Power LED on each LDU is green (see [page 163](#)).

X.21 Installation

To install a long distance LDM link via modem and X.21 line proceed as follows;

1. Follow the procedure given in given in [Installation](#) on page [164](#).
2. At the host card site, connect an LDU to an X.21 asynchronous modem using the DB25 female flying lead on the LDU via a DB25 female to DB15 male adaptor as shown in the next picture.
3. At the remote site, repeat step [2](#). to connect the LDU and so forth.



4. At both the host card and remote sites, connect each LDU to any free link socket on the associated RTA using the RIO Link flying lead.
5. At each site, ensure the modems are connected to the required leased line.
6. When the Host Card and RTAs at each end of the LDM connection are powered up, check that the Power LED on each LDU is green (see [page 163](#)).

LDM Cabling information

This section contains cabling information for installing Long Distance Modules.

Note

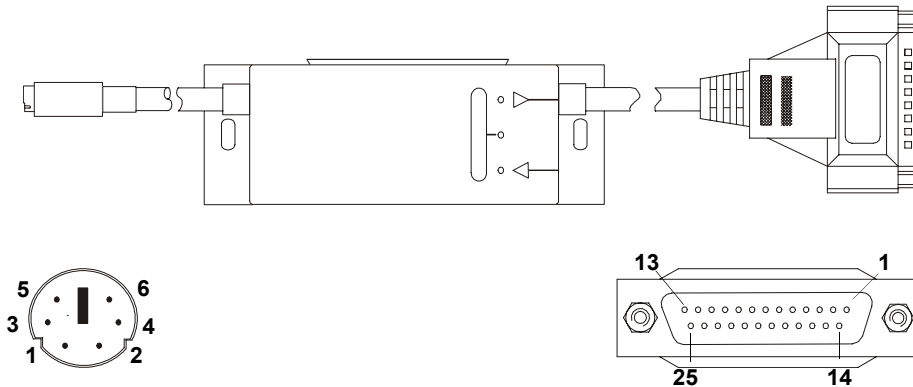
For modem installations, a converter cable must be used to connect the LDU DB25 flying lead to the modem. See [Asynchronous/Synchronous Modem & X21bis \(DB25 female to DB25 male\)](#) on page 172.

On long-wire installations, you can connect the long wire directly to the DB25 flying lead. See [Asynchronous Long-wire Connection \(DB25 male to DB25 male\)](#) on page 171.

For X.21 Synchronous connections, you need to use a converter cable to connect the DB25 flying lead to the X21 interface. See [Synchronous X.21 connection](#) on page 173.

LDU flying lead connector pinouts

Cable diagram



Mini DIN on RIO link flying lead

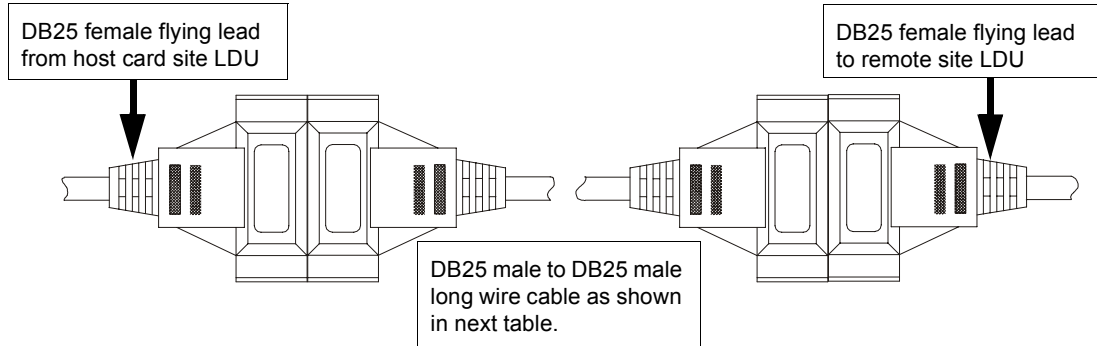
Pin	Signal	Description	Pin	Signal	Description
1	GND	Ground	5	RXD+	Receive Data
2	VCC	Supply Voltage	6	TXD+	Transmit Data
3	RXD-	Inverse RXD			
4	TXD-	Inverse TXD			

DB25 female on flying lead

Pin	Signal	Name	Direction
1	Chassis	Chassis Ground	—
2	TXD	Transmit Data	Output RS232
3	RXD	Receive Data	Input RS232
4	RTS*	Request To Send	Output RS232
5	CTS*	Clear To send	Input RS232
6	N/C	Not Connected	—
7	GND	Ground	—
8	DCD*	Data Carrier Detect	Input RS232
9	DCD+	Data Carrier Detect	Input RS422
10	RXD-	Inverse RXD	Input RS422
11	RXD+	Receive Data	Input RS422
12	TXD-	Inverse TXD	Output RS422
13	TXD+	Transmit Data	Output RS422
14	CTS-	Inverse CTS	Input RS422
15	TXC	Transmit Clock	Input RS232
16	CTS+	Clear To Send	Input RS422
17	RXC	Receive Clock	Input RS232
18	RTS-	Inverse RTS	Output RS422
19	RTS+	Request To Send	Output RS422
20	DTR*	Data Terminal ready	Output RS232
21	DCD-	Inverse DCD	Input RS422
22	DTR+	Data Terminal Ready	Output RS422
23	DTR-	Inverse DTR	Output RS422
24	RXC-	Inverse RXC	Input RS422
25	RXC+	Receive Clock	Input RS422

Adaptor pinouts for LDU flying lead connectors

Asynchronous Long-wire Connection (DB25 male to DB25 male)

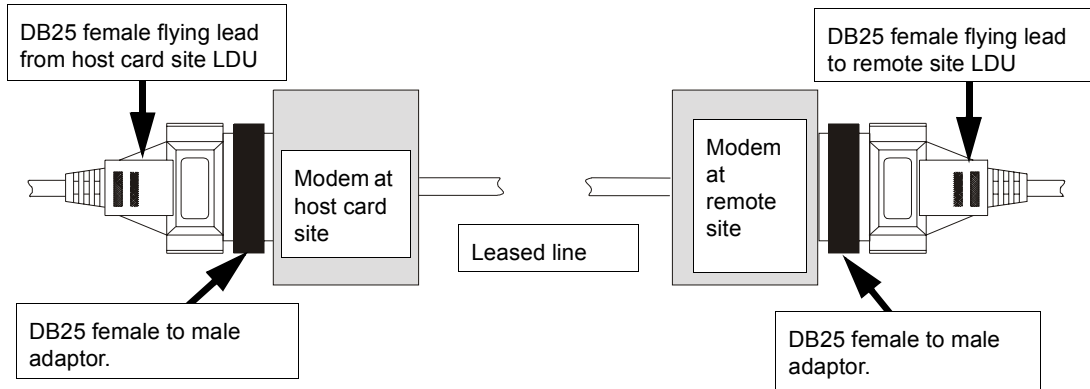


Note
Any connector pins not listed in the next table must not be connected.

DB25 male (host end)			DB25 male (remote end)		
Pin	Signal	Description	Pin	Signal	Description
7	GND	Ground	7	GND	Ground
10	RXD-	Inverse RXD	12	TXD-	Inverse TXD
11	RXD+	Receive Data	13	TXD+	Transmit Data
12	TXD-	Inverse TXD	10	RXD-	Inverse RXD
13	TXD+	Transmit Data	11	RXD+	Receive Data

Note
If you are going to build your own Long-wire cable, make sure it conforms to the Category 5 specification.

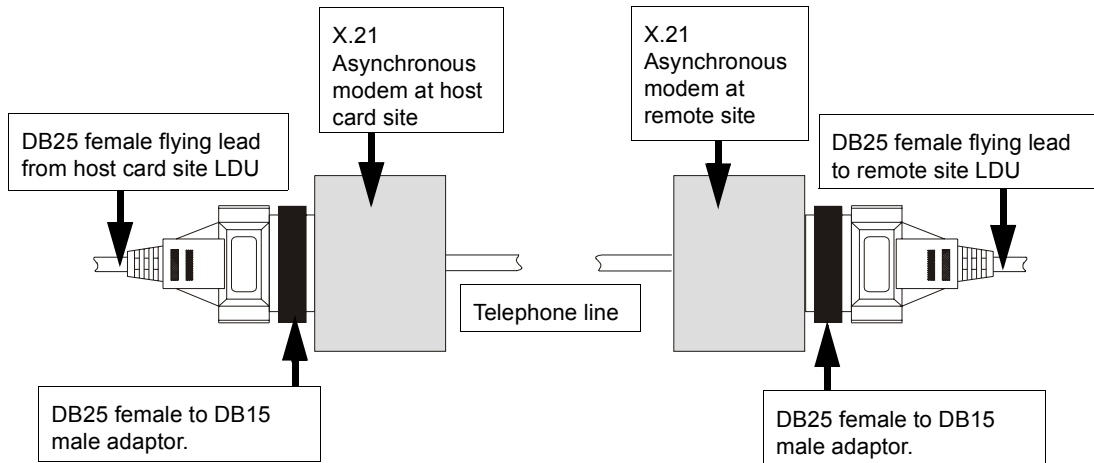
Asynchronous/Synchronous Modem & X21bis (DB25 female to DB25 male)



Note
Any connector pins not listed in the next table must not be connected.

DB25 female (LDU)			DB25 male (Modem)		
Pin	Signal	Description	Pin	Signal	Description
2	TXD	Transmit Data	2	TXD	Transmit Data
3	RXD	Receive Data	3	RXD	Receive Data
4	RTS	Request To Send	4	RTS	Request To Send
5	CTS	Clear To Send	5	CTS	Clear To Send
7	GND	Ground	7	GND	Ground
8	DCD	Data Carrier Detect	8	DCD	Data Carrier Detect
15	TXC	Transmit Clock	15	TXC	Transmit Clock
17	RXC	Receive Clock	17	RXC	Receive Clock
20	DTR	Data Terminal Ready	20	DTR	Data Terminal Ready

Synchronous X.21 connection



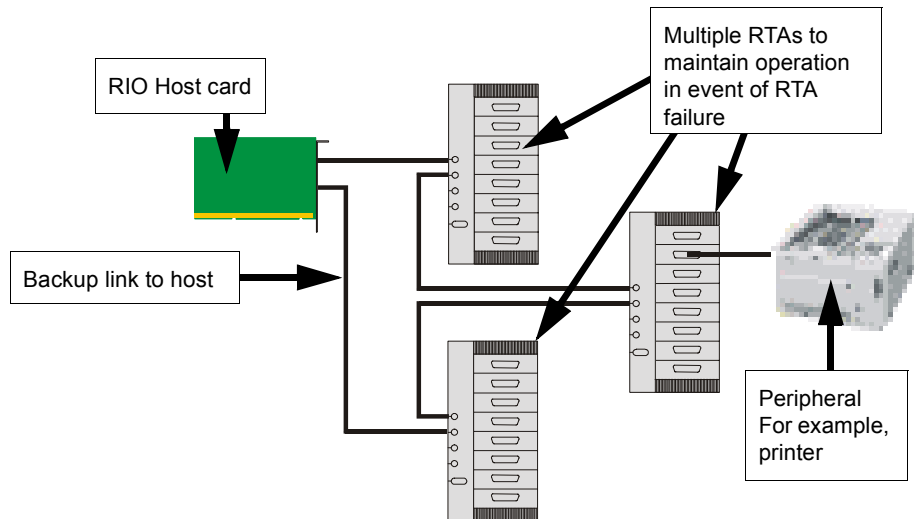
Note
Any connector pins not listed in the next table must not be connected.

DB25 female (LDU)			DB15 male (Modem)		
Pin	Signal	Description	Pin	Signal	Description
1	Chassis	Chassis ground	1	Chassis	Chassis ground
7	GND	Ground	8	GND	Ground
9	DCD+	Data Carrier Detect	5	Indicate+	Indicate+
10	RXD-	Inverse RXD	11	RXD-	Inverse RXD
11	RXD+	Receive Data	4	RXD+	Receive Data
12	TXD-	Inverse TXD	9	TXD-	Inverse TXD
13	TXD+	Transmit Data	2	TXD+	Transmit Data
21	DCD-	Data Carrier Detect	12	Indicate-	Indicate-
22	DTR+	Data Terminal Ready	3	Control+	Control
23	DTR-	Inverse DTR	10	Control-	Inverse Control
24	RXC-	Inverse RXC	13	Clock-	Inverse clock
25	RXC+	Receive Clock	6	Clock+	Clock

Installing a fault tolerant link

In a typical non fault tolerant RIO system, a host card is connected to a peripheral (for example, printer) via a single link and RTA. In order to make the system fault tolerant, that is to protect against RTA or link failure, multiple RTAs and links are added.

The next picture shows a typical system which features two backup RTAs and a backup link to the host. If one RTA or link cable is damaged there is still a path from the host and system operation is not disrupted.



To install a fault tolerant system proceed as follows;

1. Install the system components as normal using procedures described earlier in this chapter up to the point at which you add the links to the system.

Note

Please refer to [Before you start](#) on page 31 to select the correct installation procedure for your operating system.

2. When you install the links in your system, install extra links for a given device (for example, an RTA8) such that there is at least two routes to each device.
3. Continue with the installation procedure as normal through to completion.

Note

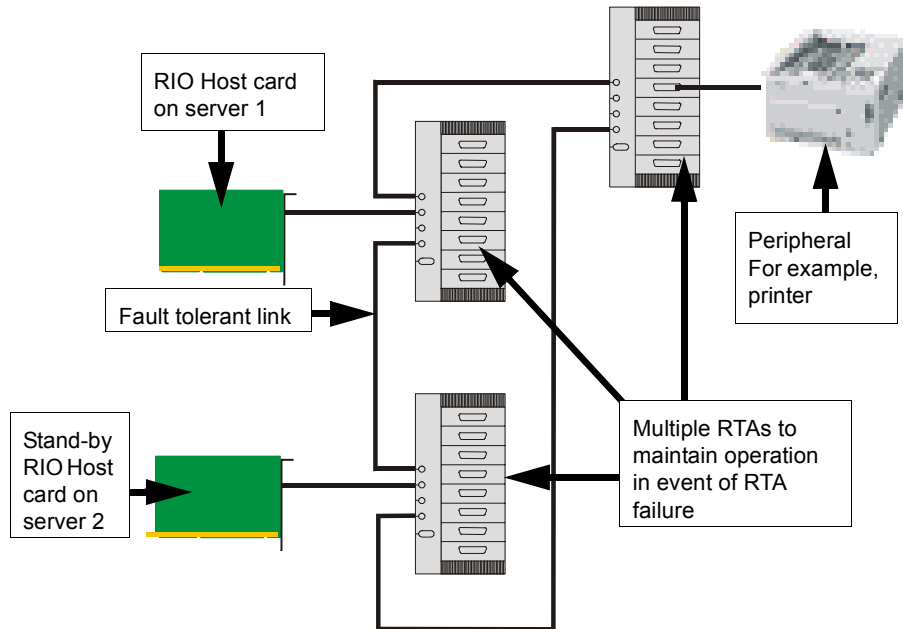
No extra configuration is required by the user for a fault tolerant system.

Installing a dual host fail-safe link (UNIX only)

A dual host fail-safe system allows you to connect a network of RTAs to two systems each with its own host card, one being the main system, and the other a backup in case of system failure. A typical system shown in the next picture. This features two host systems (server 1 and server 2) each with a RIO host card, sharing three RTAs. Server 1 is to be main system (master), server 2 is to be backup system (slave). Note that a fault tolerant link is often added between RTAs for additional protection of the system

Hint

You can simulate master system failure by removing the link cable to main system's host card.



To install a dual host fail-safe system, see the following:

- [Installing a dual host failsafe link under Solaris](#) on page 176
- [Installing a dual host failsafe link under SCO OpenServer](#) on page 180
- [Installing a dual host failsafe link under SCO UnixWare](#) on page 182

Installing a dual host failsafe link under Solaris

Installing for normal operation

To install a dual host fail-safe system for normal operation proceed as follows;

Note

In the event of **master** system failure, you will need to configure the **slave** system to take over using the procedure given in [Transferring control to the slave system](#) on page 179.

1. Install the host cards and RIO drivers on both systems. See [Installing a PCI host card](#) on page 142, [Installing an ISA host card](#) on page 143 and [Installing device drivers and utilities](#) on page 37.
2. Install the RTAs you want onto master system only (no link connection to slave). See [Installing Remote Terminal Adaptors \(RTAs\)](#) on page 146.
3. On the master system, run the **rioconfig** utility to add RTAs and port devices. See [Updating your RIO system configuration](#) on page 49.
4. On the **slave** system, display the **rio.cf** file (located in the etc/rio/ directory) and note the host card details (for example, **HOST:a5000387:HOST 1:boot:**). See also [Appendix B rio.cf administration file](#).


```

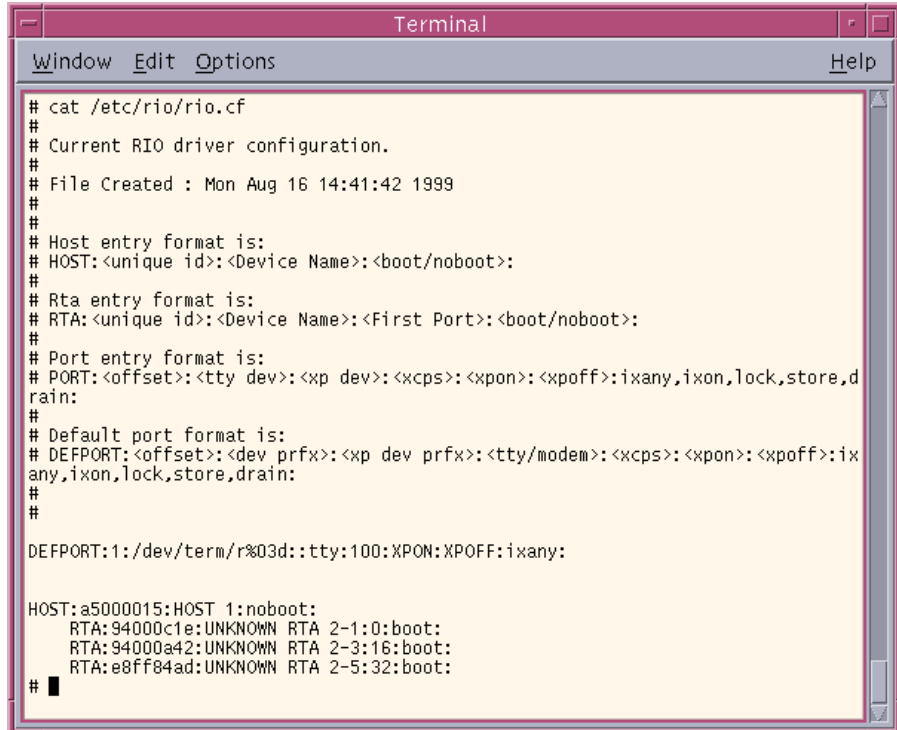
Terminal
Window Edit Options Help
# cat /etc/rio/rio.cf
#
# Current RIO driver configuration.
#
# File Created : Mon Aug 16 14:41:42 1999
#
#
# Host entry format is:
# HOST: <unique id>:<Device Name>:<boot/noboot>:
#
# Rta entry format is:
# RTA: <unique id>:<Device Name>:<First Port>:<boot/noboot>:
#
# Port entry format is:
# PORT: <offset>:<tty dev>:<xp dev>:<xcps>:<xpon>:<xpoff>:ixany,ixon,lock,store,d
rain:
#
# Default port format is:
# DEFPORT: <offset>:<dev prfx>:<xp dev prfx>:<tty/modem>:<xcps>:<xpon>:<xpoff>:ix
any,ixon,lock,store,drain:
#
#
DEFPORT:1:/dev/term/r%03d::tty:100:XPON:XPOFF:ixany:

HOST:a5000015:HOST 1:boot:
# █

```

5. Copy the **master rio.cf** file to the slave system.

6. Edit the **slave** copy of **rio.cf** (see [Appendix B rio.cf administration file](#) for syntax) as follows;
 - a. Replace master host card details with slave host card details.
 - b. Alter the **slave** host card "boot" setting to "noboot". (e.g. "HOST:a5000387:HOST 1:noboot:")



```

# cat /etc/rio/rio.cf
#
# Current RIO driver configuration.
# File Created : Mon Aug 16 14:41:42 1999
#
# Host entry format is:
# HOST:<unique id>:<Device Name>:<boot/noboot>:
#
# Rta entry format is:
# RTA:<unique id>:<Device Name>:<First Port>:<boot/noboot>:
#
# Port entry format is:
# PORT:<offset>:<tty dev>:<xp dev>:<xcps>:<xpon>:<xpoff>:ixany,ixon,lock,store,d
rain:
#
# Default port format is:
# DEFPORT:<offset>:<dev prfx>:<xp dev prfx>:<tty/modem>:<xcps>:<xpon>:<xpoff>:ix
any,ixon,lock,store,drain:
#
#
DEFPORT:1:/dev/term/r%03d::tty:100:XPON:XPOFF:ixany:

HOST:a5000015:HOST 1:noboot:
  RTA:94000c1e:UNKNOWN RTA 2-1:0:boot:
  RTA:94000a42:UNKNOWN RTA 2-3:16:boot:
  RTA:e8ff84ad:UNKNOWN RTA 2-5:32:boot:
#
  
```

7. On the slave system, run the **rioconfig** utility to create port devices.
8. Connect the RTAs to the **slave** system. See [Installing Remote Terminal Adaptors \(RTAs\)](#) on page [146](#).

You can now use your dual host fail-safe system, however the RTAs will only be booted or accessible from the **master** system.

Transferring control to the slave system

If the master system fails you need to use the following procedure to transfer control of the RTAs to the slave system

1. On the **slave** system, edit the **rio.cf** file (located in the `/etc/rio/` directory), and alter the host card setting from "noboot" to "boot". (for example, "HOST:a5000387:HOST 1:boot:"). See also [Appendix B rio.cf administration file](#).
2. On the slave system, run the rioconfig utility. See [Updating your RIO system configuration](#) on page 49.
3. on slave system command line type `/etc/rioreboot -n` and press the Enter key

All RTAs and ports will be reset (this may take some time), and when complete will be accessible from the slave system.

Installing a dual host failsafe link under SCO OpenServer

Installing for normal operation

To install a dual host fail-safe system for normal operation under SCO OpenServer proceed as follows;

Note

In the event of **master** system failure, you will need to configure the **slave** system to take over using the procedure given in [Transferring control to the slave system](#) on page 181.

1. Install the host cards and RIO drivers on both systems. See [Installing a PCI host card](#) on page 142, [Installing an ISA host card](#) on page 143 and [Installing device drivers and utilities](#) on page 52.
2. Install the RTAs you want onto **master system only** (no link connection to slave). See [Installing Remote Terminal Adaptors \(RTAs\)](#) on page 146.
3. On the **master** system, run the **config.rio** utility to add RTAs and port devices. See [Configuring ports with config.rio](#) on page 62, and [Adding an RTA to the system](#) on page 63.
4. Repeat step 3. for the **slave** system using an identical configuration to the **master** system.
5. For the **slave** system, from within the **config.rio** menu, click on **Boot mode: > Boot no RTAs**.
6. On the **slave** system, run the **config.rio** utility to create port devices.
7. Connect the RTAs to the **slave** system. See [Installing Remote Terminal Adaptors \(RTAs\)](#) on page 146.

You can now use your dual host fail-safe system, however the RTAs will only be booted or accessible from the **master** system.

Transferring control to the slave system

If the master system fails you need to use the following procedure to transfer control of the RTAs to the slave system

1. On the **slave** system, from within the **config.rio** Main menu, click on **Boot mode: > Boot all RTAs** .
1. On the **slave** system, from within the **config.rio** Main menu, click on **Reset host interconnections**.

All RTAs and ports will be reset (this may take some time), and when complete will be accessible from the slave system.

Installing a dual host failsafe link under SCO UnixWare

Installing for normal operation

To install a dual host fail-safe system for normal operation under SCO UnixWare proceed as follows;

Note

In the event of **master** system failure, you will need to configure the **slave** system to take over using the procedure given in [Transferring control to the slave system](#) on page 183.

1. Install the host cards and RIO drivers on both systems. See [Installing a PCI host card](#) on page 142, [Installing an ISA host card](#) on page 143 and [Installing device drivers and utilities](#) on page 75.
2. Install the RTAs you want onto **master system only** (no link connection to slave). See [Installing Remote Terminal Adaptors \(RTAs\)](#) on page 146.
3. On the **master** system, run the **config.rio** utility to add RTAs and port devices. See [Configuring ports with config.rio](#) on page 79, and [Adding an RTA to the system](#) on page 80.
4. Repeat step 3. for the **slave** system using an identical configuration to the **master** system.
5. For the **slave** system, from within the **config.rio** menu, click on **Boot mode: > Boot no RTAs**.
6. On the **slave** system, run the **config.rio** utility to create port devices.
7. Connect the RTAs to the **slave** system. See [Installing Remote Terminal Adaptors \(RTAs\)](#) on page 146.

You can now use your dual host fail-safe system, however the RTAs will only be booted or accessible from the **master** system.

Transferring control to the slave system

If the master system fails you need to use the following procedure to transfer control of the RTAs to the slave system

1. On the **slave** system, from within the **config.rio** Main menu, click on **Boot mode: > Boot all RTAs** .
1. On the **slave** system, from within the **config.rio** Main menu, click on **Reset host interconnections**.

All RTAs and ports will be reset (this may take some time), and when complete will be accessible from the slave system.

Chapter 3 RIO Cabling information

You need to read this chapter if you want to...

You need to read this chapter if you want cabling information for the Perle RIO serial connectivity system hardware.

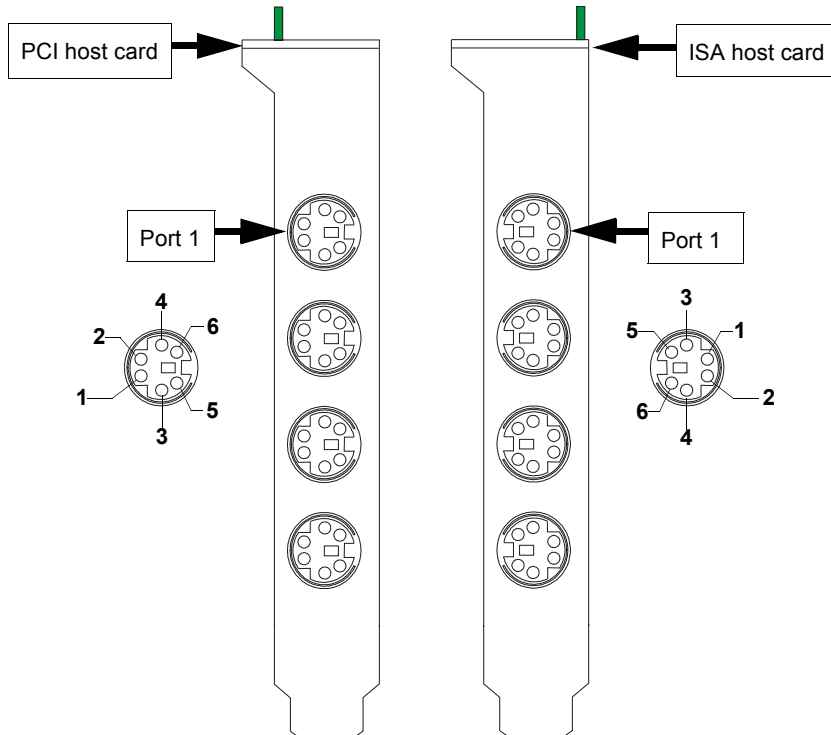
This chapter provides cabling and connector pinout information for the Perle RIO system. Included are details of about which cables to use, their pinouts and details of standard cables for use with RIO products available from Perle.

This chapter includes the following sections;

- [Mini DIN pinouts on RIO host cards](#) on page [185](#)
- [RTA connector pinouts](#) on page [186](#)
- [Connecting RIO host cards to RTAs](#) on page [192](#)
- [Connecting RTAs to terminals](#) on page [192](#)
- [Connecting RTAs to modems](#) on page [193](#)
- [Connecting RTAs to parallel printers](#) on page [194](#)
- [Connecting RTAs to serial printers](#) on page [195](#)
- [Cable connector pinouts](#) on page [196](#)
- [RIO cables available from Perle](#) on page [204](#)
- [Fibre optic link \(FOLK\) cable specifications](#) on page [206](#)
- [Loopback connector pinouts](#) on page [207](#)

Mini DIN pinouts on RIO host cards

The connector pinout for each mini DIN socket fitted to either RIO ISA or PCI host cards is as follows;



Pin	Signal	Description
1	GND	Ground
2	VCC	Supply voltage
3	RXD-	Inverse RXD
4	TXD-	Inverse TXD
5	RXD+	Receive data
6	TXD+	Transmit data

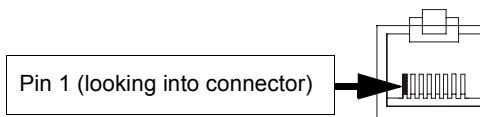
RTA connector pinouts

RTA connector guide

Remote terminal adaptors RTAS are fitted with a number of different connector types as shown in the next table;

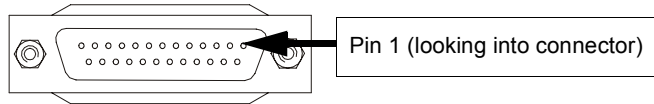
RTA type	Cable description (RTA to Terminal)	To find details...
RTA8/RJX	RJ45 female.	See page 187 .
RTA8/RJ		
RTA16/RJX		
RRC16/RJX		
RTA8/DX	DB25 female	See page 188 .
RTA8/D		
RTA8/P ports 5, 6,7 and 8		
RTA16/DX		
RTA16/D		
RTA8/MX	DB25 male	See page 190 .
RTA8/M		
RTA8/P ports 2,3 and 4	DB25 female	See page 188
RTA8/422	DB25 female	See page 189 .
RTA8/P port1	DB25 parallel female	See page 191

RJ45 female RTA connector pinout



Pin	Signal	Direction	Description
1	DCD	In	Data Carrier Detect
2	DTR	Out	Data Terminal Ready
3	DSR	In	Data Set Ready
4	S/GND		Signal ground
5	TXD	Out	Transmit Data
6	RXD	In	Receive Data
7	RTS	Out	Request To Send
8	CTS	In	Clear To Send
Shield			

DB25 female RTA connector pinout

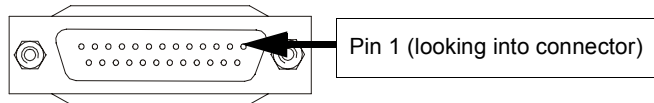


Pin	Signal	Direction	Description
1	Chassis		Chassis ground
2	TXD	In	Transmit Data
3	RXD	Out	Receive Data
4	RTS	In	Request To Send
5	CTS	Out	Clear To Send
6	DSR	Out	Data Set Ready
7	GND		Ground
8	DCD	In	Data Carrier Detect
20	DTR	In	Data Terminal Ready
22	RI	In	Ring Indicator

RS422 DB25 female RTA connector pinout

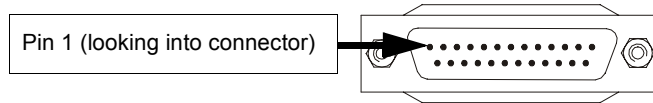
Note

The pinout for cables connected to the RTA8/RS422 variant depends on the device being connected to. For further details refer to the documentation supplied with the product to be connected to.



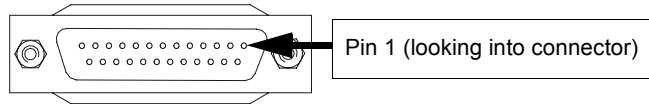
Pin	Signal	Direction	Description
1	CHASSIS		Chassis
2	RXD+	In	Receive Data
3	TXD+	Out	Transmit Data
4	RTS+	In	Receive Hardware Flow Control
5	CTS+	Out	Transmit Hardware Flow Control
6	DCD+	In	Data Carrier Detect
7	GROUND		Connects to logic 0V
8	DTR+	Out	Data Terminal Ready
10	DTR-	Out	Inverse DTR
13	CTS-	Out	Inverse CTS
14	RXD-	In	Inverse RXD
16	TXD-	Out	Inverse TXD
18	DCD-	In	Inverse DCD
19	RTS-	In	Inverse RTS
20	DSR+	In	Data Set Ready
21	RI-	In	Inverse Ring Indicator
22	RI+	In	Ring Indicator
23	DSR-	In	Inverse DSR

DB25 male RTA connector pinout



Pin	Signal	Direction	Description
2	TXD	Out	Transmit Data
3	RXD	In	Receive Data
4	RTS	Out	Request To Send
5	CTS	In	Clear To Send
6	DSR	In	Data Set Ready
7	GND		Ground
8	DCD	In	Data Carrier Detect
20	DTR	Out	Data Terminal Ready
22	RI	In	Ring Indicator

DB25 parallel female RTA connector pinout



Pin	Signal	Direction	Description
1	STROBEN*	Output	PSTROBE
2	D0	Output	DATA 1
3	D1	Output	DATA 2
4	D2	Output	DATA 3
5	D3	Output	DATA 4
6	D4	Output	DATA 5
7	D5	Output	DATA 6
8	D6	Output	DATA 7
9	D7	Output	DATA 8
10	PACKN*	Input	ACK
11	PBUSY	Input	BUSY
12	PPE	Input	PE
13	PSLCT	Input	SLCT
14	AUTOFDXT*	Output	AUTOFEED
15	PERRORN*	Input	FAULT
16	PINITN*	Output	INPUT PRIME
17	PSLINN*	Output	SLCT IN
18	GND	—	GROUND
19	GND	—	GROUND
20	GND	—	GROUND
21	GND	—	GROUND
22	GND	—	GROUND
23	GND	—	GROUND
24	GND	—	GROUND
25	GND	—	GROUND

Connecting RIO host cards to RTAs

To connect a RIO host card to an RTA you use a RIO link cable. See [Link Cable](#) on page 204 and [Link cable specification](#) on page 205 for further details.

Connecting RTAs to terminals

To connect your RTA to a terminal you use the cable types detailed in the next table

RTA type	Cable description (RTA to Terminal)
RTA8/RJX	RJ45 male to DB25 female DCE for connection to DTE devices on page 200
RTA8/RJ	RJ45 male to DB25 female DCE for connection to DTE devices on page 200
RTA8/DX	DB25 male to DB25 female DCE for connection to DTE devices on page 201
RTA8/D	DB25 male to DB25 female DCE for connection to DTE devices on page 201
RTA8/MX	DB25 female to DB25 female DCE for connection to DTE devices on page 202
RTA8/M	DB25 female to DB25 female DCE for connection to DTE devices on page 202
RTA8/P port1	DB25 parallel male to centronics parallel on page 203
RTA8/P ports 2,3 and 4	DB25 male to DB25 female DCE for connection to DTE devices on page 201
RTA8/P ports 5, 6,7 and 8	DB25 male to DB25 female DCE for connection to DTE devices on page 201
RTA8/422	<p>The pinout for cables connected to the RTA8/RS422 variant depends on the device being connected to. For further details refer to the documentation supplied with the product to be connected to.</p> <p>For the pinout of the connector used on the RTA8/RS422, see RS422 DB25 female RTA connector pinout on page 189</p>
RTA16/RJX	RJ45 male to DB25 female DCE for connection to DTE devices on page 200
RTA16/DX	DB25 male to DB25 female DCE for connection to DTE devices on page 201
RTA16/D	DB25 male to DB25 female DCE for connection to DTE devices on page 201
RRC16/RJX	RJ45 male to DB25 female DCE for connection to DTE devices on page 200

Connecting RTAs to modems

To connect your RTA to a modem you use the cable types detailed in the next table;

RTA type	Cable description (RTA to modem)
RTA8/RJX	RJ45 male to DB25 male DTE for connection to DCE devices on page 197
RTA8/RJ	RJ45 male to DB25 male DTE for connection to DCE devices on page 197
RTA8/DX	RJ45 male to DB25 male DTE for connection to DCE devices on page 197
RTA8/D	RJ45 male to DB25 male DTE for connection to DCE devices on page 197
RTA8/MX	DB25 female to DB25 male DTE for connection to DCE devices on page 199
RTA8/M	DB25 female to DB25 male DTE for connection to DCE devices on page 199
RTA8/P port1	DB25 parallel male to centronics parallel on page 203
RTA8/P ports 2,3 and 4	DB25 male to DB25 male DTE for connection to DCE devices on page 198
RTA8/P ports 5, 6,7 and 8	DB25 male to DB25 male DTE for connection to DCE devices on page 198
RTA8/422	<p>The pinout for cables connected to the RTA8/RS422 variant depends on the device being connected to. For further details refer to the documentation supplied with the product to be connected to.</p> <p>For the pinout of the connector used on the RTA8/RS422, see RS422 DB25 female RTA connector pinout on page 189</p>
RTA16/RJX	RJ45 male to DB25 male DTE for connection to DCE devices on page 197
RTA16/DX	RJ45 male to DB25 male DTE for connection to DCE devices on page 197
RTA16/D	RJ45 male to DB25 male DTE for connection to DCE devices on page 197
RRC16/RJX	RJ45 male to DB25 male DTE for connection to DCE devices on page 197

Connecting RTAs to parallel printers

To connect your RTA to a parallel printer you use the cable types detailed in the next table;

RTA type	Cable description (RTA to parallel printers)
RTA8/PX	DB25 parallel male to centronics parallel on page 203
RTA8/P	DB25 parallel male to centronics parallel on page 203

Connecting RTAs to serial printers

To connect your RTA to a serial printer you use the cable types detailed in the next table

RTA type	Cable description (RTA to Serial printer)
RTA8/RJX	RJ45 male to DB25 female DCE for connection to DTE devices on page 200
RTA8/RJ	RJ45 male to DB25 female DCE for connection to DTE devices on page 200
RTA8/DX	DB25 male to DB25 female DCE for connection to DTE devices on page 201
RTA8/D	DB25 male to DB25 female DCE for connection to DTE devices on page 201
RTA8/MX	DB25 female to DB25 female DCE for connection to DTE devices on page 202
RTA8/M	DB25 female to DB25 female DCE for connection to DTE devices on page 202
RTA8/P port1	DB25 parallel male to centronics parallel on page 203
RTA8/P ports 2,3 and 4	DB25 male to DB25 female DCE for connection to DTE devices on page 201
RTA8/P ports 5, 6,7 and 8	DB25 male to DB25 female DCE for connection to DTE devices on page 201
RTA8/422	<p>The pinout for cables connected to the RTA8/RS422 variant depends on the device being connected to. For further details refer to the documentation supplied with the product to be connected to.</p> <p>For the pinout of the connector used on the RTA8/RS422, see RS422 DB25 female RTA connector pinout on page 189</p>
RTA16/RJX	RJ45 male to DB25 female DCE for connection to DTE devices on page 200
RTA16/DX	DB25 male to DB25 female DCE for connection to DTE devices on page 201
RTA16/D	DB25 male to DB25 female DCE for connection to DTE devices on page 201
RRC16/RJX	RJ45 male to DB25 female DCE for connection to DTE devices on page 200

Cable connector pinouts

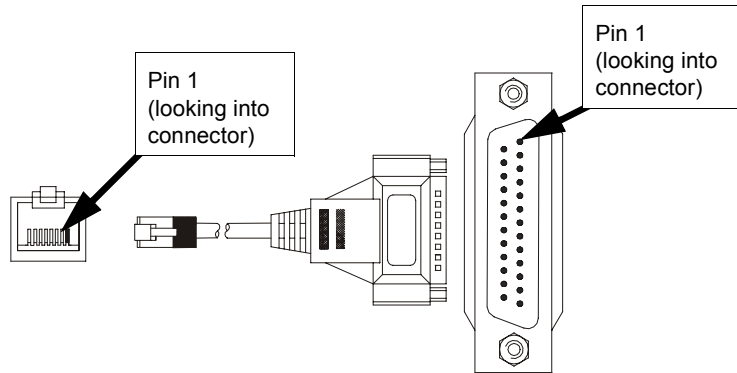
This section includes the following;

- [RJ45 male to DB25 male DTE for connection to DCE devices](#) on page [197](#)
- [DB25 male to DB25 male DTE for connection to DCE devices](#) on page [198](#)
- [DB25 female to DB25 male DTE for connection to DCE devices](#) on page [199](#)
- [RJ45 male to DB25 female DCE for connection to DTE devices](#) on page [200](#)
- [DB25 male to DB25 female DCE for connection to DTE devices](#) on page [201](#)
- [DB25 female to DB25 female DCE for connection to DTE devices](#) on page [202](#)
- [DB25 parallel male to centronics parallel](#) on page [203](#).

RJ45 male to DB25 male DTE for connection to DCE devices

Typical uses This type of cable is used to connect to DCE devices such as Modems.

Cable diagram



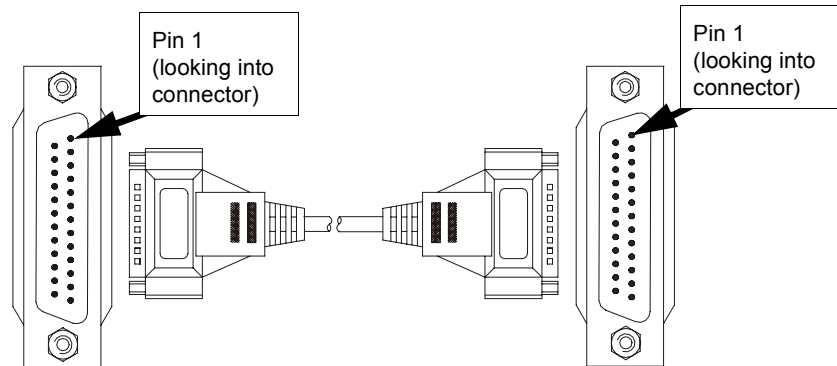
Connector pinout table

RJ45				DB25		
Pin	Signal	Direction	Description	Pin	Signal	Description
1	DCD	In	Data Carrier Detect	8	DCD	Data Carrier Detect
2	DTR	Out	Data Terminal Ready	20	DTR	Data Terminal Ready
3	DSR	In	Data Set Ready	6	DSR	Data Set Ready
4	S/GND		Signal ground	7	S/GND	Signal ground
5	TXD	Out	Transmit Data	2	TXD	Transmit Data
6	RXD	In	Receive Data	3	RXD	Receive Data
7	RTS	Out	Request To Send	4	RTS	Request To Send
8	CTS	In	Clear To Send	5	CTS	Clear To Send
Shield						Chassis ground

DB25 male to DB25 male DTE for connection to DCE devices

Typical uses This type of cable is used to connect to DCE devices such as Modems.

Cable diagram



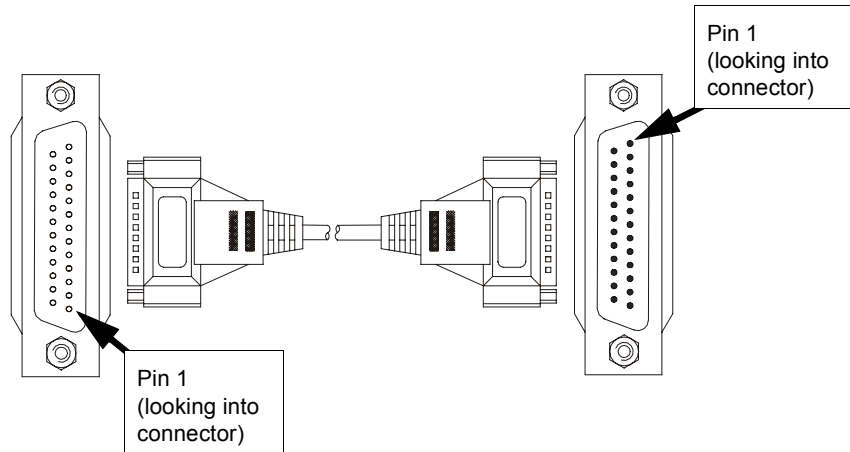
Connector pinout table

DB25				DB25		
Pin	Signal	Direction	Description	Pin	Signal	Description
1	Chassis		Chassis ground	1	Chassis	Chassis ground
2	TXD	In	Transmit Data	3	RXD	Receive Data
3	RXD	Out	Receive Data	2	TXD	Transmit Data
4	RTS	In	Request To Send	5	CTS	Clear To Send
5	CTS	Out	Clear To Send	4	RTS	Request To Send
6	DSR	Out	Data Set Ready	20	DTR	Data Terminal Ready
7	GND		Ground	7	GND	Ground
8	DCD	In	Data Carrier Detect	8	DCD	Data Carrier Detect
20	DTR	In	Data Terminal Ready	6	DSR	Data Set Ready

DB25 female to DB25 male DTE for connection to DCE devices

Typical uses This type of cable is used to connect to DCE devices such as Modems.

Cable diagram



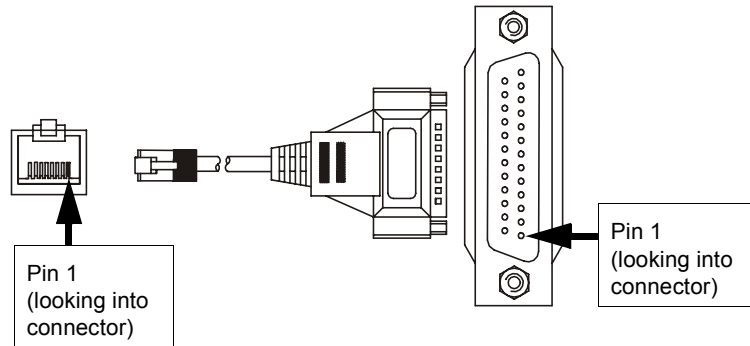
Connector pinout table

DB25				DB25		
Pin	Signal	Direction	Description	Pin	Signal	Description
2	TXD	Out	Transmit Data	2	TXD	Transmit Data
3	RXD	In	Receive Data	3	RXD	Receive Data
4	RTS	Out	Ready to send	4	RTS	Ready to send
5	CTS	In	Clear to send	5	CTS	Clear to send
6	DSR	In	Data Set Ready	6	DSR	Data Set Ready
7	GND		Ground	7	GND	Ground
8	DCD	In	Data Carrier Detect	8	DCD	Data Carrier Detect
20	DTR	Out	Data Terminal Ready	20	DTR	Data Terminal Ready

RJ45 male to DB25 female DCE for connection to DTE devices

Typical uses This type of cable is used to connect to DTE devices such as Terminals, PCs or printers.

Cable diagram



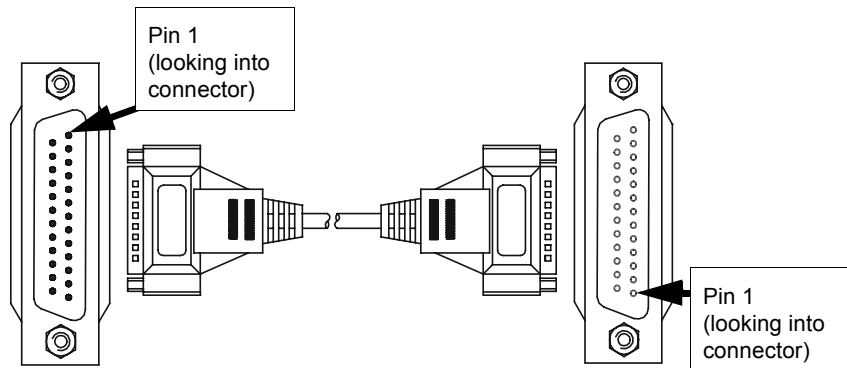
Connector pinout table

RJ45				DB25 pin		
Pin	Signal	Direction	Description	Pin	Signal	Description
1	DCD	In	Data Carrier Detect	8	DCD	Data Carrier Detect
2	DTR	Out	Data Terminal Ready	6	DSR	Data Set Ready
3	DSR	In	Data Set Ready	20	DTR	Data Terminal Ready
4	S/GND		Signal ground	7	S/GND	Signal ground
5	TXD	Out	Transmit Data	3	RXD	Receive Data
6	RXD	In	Receive Data	2	TXD	Transmit Data
7	RTS	Out	Request To Send	5	CTS	Clear To Send
8	CTS	In	Clear To Send	4	RTS	Request To Send
Shield						Chassis ground

DB25 male to DB25 female DCE for connection to DTE devices

Typical uses This type of cable is used to connect to DTE devices such as Terminals, PCs or printers.

Cable diagram



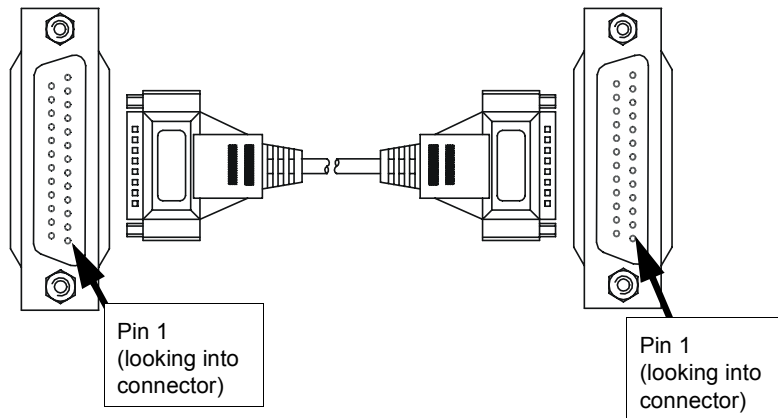
Connector pinout table

DB25				DB25		
Pin	Signal	Direction	Description	Pin	Signal	Description
2	TXD	In	Transmit Data	2	TXD	Transmit Data
3	RXD	Out	Receive Data	3	RXD	Receive Data
4	RTS	In	Request To Send	4	RTS	Request To Send
5	CTS	Out	Clear To Send	5	CTS	Clear To Send
6	DSR	Out	Data Set Ready	6	DSR	Data Set Ready
7	GND		Ground	7	GND	Ground
8	DCD	In	Data Carrier Detect	8	DCD	Data Carrier Detect
20	DTR	In	Data Terminal Ready	20	DTR	Data Terminal Ready

DB25 female to DB25 female DCE for connection to DTE devices

Typical uses This type of cable is used to connect to DTE devices such as Terminals, PCs or printers.

Cable diagram



Connector pinout table

DB25				DB25		
Pin	Signal	Direction	Description	Pin	Signal	Description
2	TXD	Out	Receive Data	3	RXD	Transmit Data
3	RXD	In	Transmit Data	2	TXD	Receive Data
4	RTS	Out	Request To Send	5	CTS	Clear To Send
5	CTS	In	Clear To Send	4	RTS	Request To Send
6	DSR	In	Data Set Ready	20	DTR	Data Terminal Ready
7	GND		Ground	7	GND	Ground
8	DCD	In	Data Carrier Detect	8	DCD	Data Carrier Detect
20	DTR	Out	Data Terminal Ready	6	DSR	Data Set Ready

DB25 parallel male to centronics parallel

Note

The following pinout is included for information only and shows the DB25 pinout only. If you require this type of cable, we recommend obtaining a suitable standard PC parallel printer cable rather than making one.

* Denotes active low.

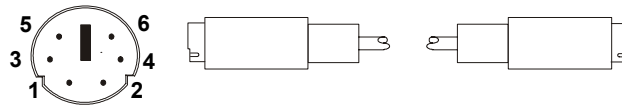
Pin	Signal	Direction	Description
1	STROBEN*	Output	PSTROBE
2	D0	Output	DATA 1
3	D1	Output	DATA 2
4	D2	Output	DATA 3
5	D3	Output	DATA 4
6	D4	Output	DATA 5
7	D5	Output	DATA 6
8	D6	Output	DATA 7
9	D7	Output	DATA 8
10	PACKN*	Input	ACK
11	PBUSY	Input	BUSY
12	PPE	Input	PE
13	PSLCT	Input	SLCT
14	AUTOFDXT*	Output	AUTOFEED
15	PERRORN*	Input	FAULT
16	PINITN*	Output	INPUT PRIME
17	PSLINN*	Output	SLCT IN
18	GND	—	GROUND
19	GND	—	GROUND
20	GND	—	GROUND
21	GND	—	GROUND
22	GND	—	GROUND
23	GND	—	GROUND
24	GND	—	GROUND
25	GND	—	GROUND

RIO cables available from Perle

Link Cable

Perle supply a range of standard link cables for RIO of varying lengths all of which use 6-way mini DIN plugs. See [Cable diagram](#) on page 204 and [Connector pinout table](#) on page 204 for general information about Perle RIO link cables.

Cable diagram



Connector pinout table

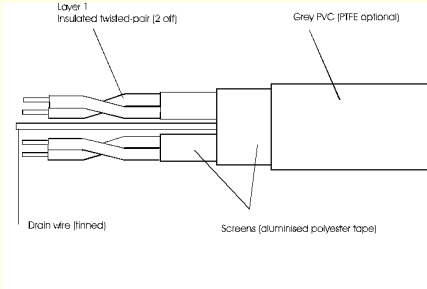
Mini DIN			Mini DIN		
PIn	Signal	Description	PIn	Signal	Description
1	GND	Ground	1	GND	Ground
2	VCC	Supply Voltage	2	VCC	Supply Voltage
3	RXD-	Inverse RXD	4	TXD-	Inverse TXD
4	TXD-	Inverse TXD	3	RXD-	Inverse RXD
5	RXD+	Receive Data	6	TXD+	Transmit Data
6	TXD+	Transmit Data	5	RXD+	Receive Data

Note

Wires 3 and 4, and 5 and 6, must be twisted together. For high noise and/or ground potential differences we recommend the Fibre-optic module.

Link cable specification

RIO link cables should conform to the following specification:

Item	Specification
Size	7/0.2 minimum
Type	<p>Two individually screened twisted pairs with drain and overall screen, sheathed over all in grey PVC (or PTFE). The screen is aluminised polyester tape. The drain wire is tinned. For particularly noisy environments and distances greater than 5 metres we recommend an additional overall braid screen</p> 
Length	5.0 metres maximum
Noise	The receiver does not require a differential input voltage more than 200mV to correctly assume the binary state over an entire common-mode voltage range of -7V to +7V. Thus, noise must not reach more than +/-7V.
Nominal Impedance	100 Ohms
Ground Potential	The maximum voltage between either receiver input and receive ground must not exceed 8V (80% - 3V signal + 7V common mode voltage) in magnitude. Thus excessive differences in 0V between communication devices (systems) are unacceptable. Typical causes are insufficient mains earthing, heavily laden mains, or heavily laden PC slots

Fibre optic link (FOLK) cable specifications

You can use a Fibre optic link (FOLK) cable in place of a normal RIO link cable with the RIO system when you want to make long distance connections up to 1 kilometre. This approach is especially useful in a high noise environment such as a machine shop where electromagnetic interference is a problem.

Perle does not supply fibre optic cables for this product. All Fibre-optic cable must conform to the following specification;

Note

When using fibre cables all manufacturers installation advice and specifications should be followed.

Item		Specification
Fibre type		62.5 µm or 125 µm multimode silica graded index fibre (= 62.5µm core diameter, 125 µm cladding inside 250 µm buffer).
Cable type		Tight buffered or jacketed.
Fibres		Duplex, 4 core, or similar, as required by installation (2 fibres are used by each fibre-optic link). Each core sub-jacketed, individually coloured.
Connectors		ST-type connector.
Strength member		Aramid strength suitable for installation procedure.
Numerical aperture		0.27 - 0.3 (0.275 will be typical of most fibres)
Attenuation		6db/km maximum at 820nm (4db will be typical of most fibres)
Cable Jacketing	General	Normal indoor cable requires installation in conduit or cable trays. In other situations, crush-resistant cables may be required to withstand handling and environment.
	Smoke vulnerable applications	Low Smoke Zero Halogen (LSOH) cable.
	Underground applications	Steel wire armouring, steel wire braid or corrugated tube cable.
	Moisture vulnerable applications	Cable with a metal (aluminium) foil layer and petroleum jelly moisture barrier.
	Aerial (pole) applications	Non-metallic, self-supporting cable.

Loopback connector pinouts

The type of loopback connector you require depends upon the connector type fitted to your Remote Terminal Adaptor (described in [RTA connector pinouts](#) on page 186) See one of the following sections for pinouts;

- [Loopback pinouts for RJ45 female connectors](#) on page 208
- [Loopback pinouts for DB25 female connectors](#) on page 209
- [Loopback pinouts for DB25 male connectors](#) on page 210.

For details of loopback and other tests see [Appendix C Troubleshooting](#).

Loopback pinouts for RJ45 female connectors

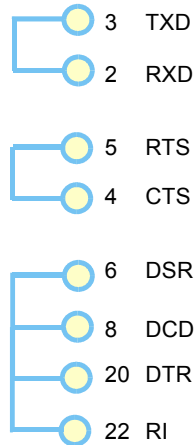
To test this type of port, your loopback connector needs to join together the connector pins shown in the next picture.



For details of RJ45 female connector pinouts see [page 187](#).

Loopback pinouts for DB25 female connectors

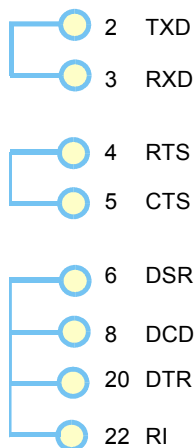
To test this type of port, your loopback connector needs to join together the connector pins shown in the next picture.



For details of DB25 female connector pinouts see [page 188](#).

Loopback pinouts for DB25 male connectors

To test this type of port, your loopback connector needs to join together the connector pins shown in the next picture.



For details of DB25 male connector pinouts see [page 190](#).

Chapter 4 Quick Reference

You need to read this chapter if you want to...

You need to read this chapter if you want information in quick reference form about the utilities provided with the RIO serial connectivity system.

This chapter provides a quick reference guide to the software utilities provided with the RIO serial connectivity system. The utilities are grouped under operating system and include main windows and menus. In addition, cross references are provided for further information about each area.

The following sections are included;

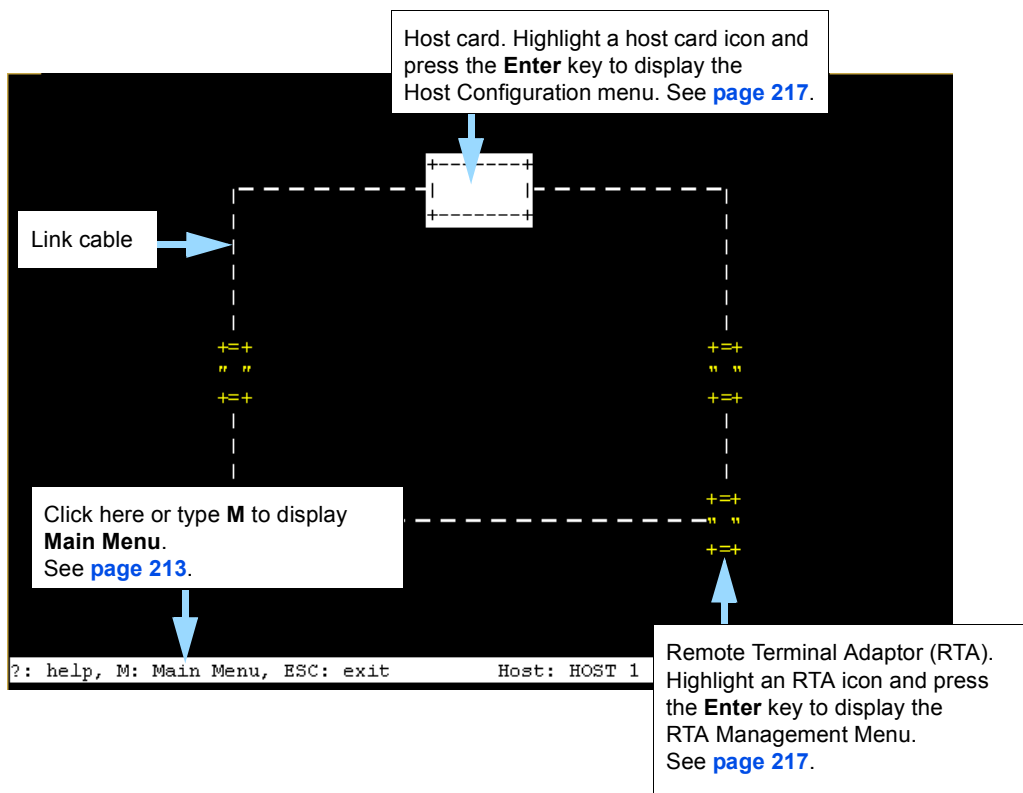
- [SCO OpenServer 5 utilities](#) on page [212](#)
- [SCO UnixWare utilities](#) on page [218](#)
- [Window NT utilities](#) on page [227](#).

SCO OpenServer 5 utilities

config.rio

Under the SCO OpenServer 5 operating system, RIO includes an application for configuring ports called **config.rio**. Config.rio provides a real time map of your system showing the Remote Terminal Adaptors, link cables and host cards and so forth that make up your system.

Main window



See the following sections for details of config.rio menus;

- [Main menu](#) on page [213](#)
- [RTA Management menu](#) on page [214](#)
- [Host Configuration menu](#) on page [217](#)

Main menu

For information on displaying this menu, see [Main window](#) on page 212

Menu option		Description
Change Hosts		Selects the host card whose configuration map you want to display. Use this when you have multiple host cards installed in your machine. See also page 62 .
Delete an RTA		Removes the currently selected RTA from the system. See also page 66 .
View / edit default values		Changes the default settings of a port. Default settings are used when an RTA is added to your system.
Change all TTYS to default values		Change all port configuration values back to their default settings.
Write RTA into file		Allows you to save the current RTA configuration settings as an ASCII text file. You can find the file in /etc/rio/rta_info .
Identify RTAs		Allows you to identify each RTA in your system by flashing the LEDs on all RTAs in a different pattern for each unit.
Reset host interconnections		Re-acquires RTAs in a dual host failsafe system. Use this option to reset the RTAs following the failure of one of the hosts.
Update configuration file		Updates your system configuration file with the latest settings without having to quit config.rio.
Boot mode:	>	Allows you to select which RTAs in your system are booted on startup when using a dual host failsafe configuration.
	Boot all RTAs	
	Boot owned RTAs	
Boot no RTAs		

RTA Management menu

For information on displaying this menu, see [Main window](#) on page [212](#)

Menu option	Description
View RTA settings	Displays the configuration of the currently selected RTA. See also page 63 .
Configure RTA	Allows you to configure TTYs and give a name to the currently selected RTA. See also page 63 .

Menu option			Description
View / edit TTY > Note this option is only displayed after the selected RTA has been configured.	Enabled? >	TTY enabled	Allows you to connect a terminal directly to the currently selected port when enabled. See also page 69 .
		Modem enabled	Allows you to connect a modem to the currently selected port when enabled (the associated transparent print device will be enabled as well). See also page 69 .
		Both disabled	Allows you to connect devices other than terminals or modems to the currently selected port. See also page 69 .
	Getty entry		Selects the default getty entry in the tty configuration. See also page 69 .
	TTY type		Selects the type of terminal connected to the current selected port.
	Chars/sec		Sets the transparent print speed.
	Force ixon		Forces software flow control on a port when enabled.
	Force -ixany		Some applications enable the stty ixany feature which allows any character to be accepted as an xon to the port. By default, the RIO driver prevents the use of ixany (that is, it sets the -ixany flag), and this parameter is set to Yes . To use ixany , set this field to No.
	Lock settings		Allows you to prevent the hardware characteristics of a port being changed. It also saves the port settings across closes (but not across reboots).

Menu option		Description	
View / edit TTY > (continued) Note this option is only displayed after the selected RTA has been configured.	Store settings	Maintains the hardware characteristics of the line across port closes and reboots when enabled. Default value is No (don't store settings).	
	Drain settings	Forces a port to wait until all data has been drained before closing when enabled When using this setting beware that a process may appear to be hung while it is waiting for all the data to be output before the close.	
	Resume output	Resumes output on a device that has hung.	
	Show port settings	Displays the stty and special RIO attributes set on the currently selected port.	
	Show modem pin settings	Displays the status of the modem pins on the selected port.	
	Port diagnostics	Runs the port diagnostics facility and displays the port diagnostics window. See also page 264 .	
	Port statistics >	Gather port statistics	Gathers statistics on the selected ports. See also page 264 .
		Reset port statistics	Resets the ports statistics counts. See also page 264 .
Show port statistics		Displays statistics for the currently selected ports. See also page 264 .	
Edit ID Name		Allows you to change the host ID name.	
Re-boot RTA		Reboots the selected RTA.	
Zombie RTA		Isolates an RTA from the system without physically disconnecting it. Once this option has been performed on an RTA it will need to be re-booted before it can be used again.	
Identify RTA		Flashes the LEDs on the selected RTA in a unique pattern to allow identification.	

Menu option		Description
RTA bound to host >	Yes	Allows the selected RTA to be booted along with the rest of the RIO system for a given host card.
	No	Excludes the selected RTA from being booted along with the rest of the RIO system for a given host card.

Host Configuration menu

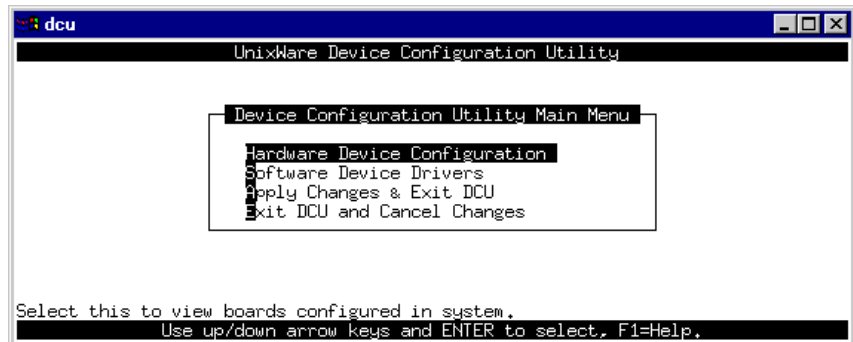
For information on displaying this menu, see [Main window](#) on page [212](#)

Menu option	Description
View Host card settings	Displays the current connections to the host card.
Edit ID Name	Allows you to edit the host card name.

SCO UnixWare utilities

Device configuration utility

The main window for the Device Configuration Utility is shown in the next picture.



Menu map

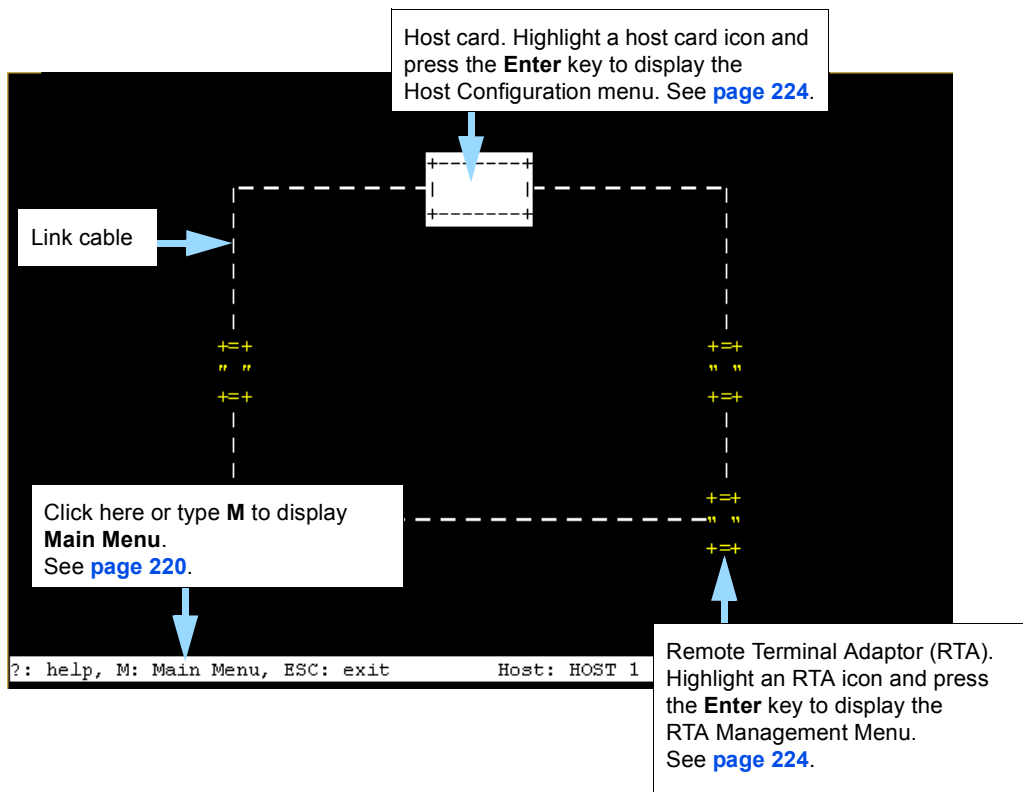
The menu is as follows;

Menu option	Description
Hardware Device Configuration >	Displays the Hardware Device Configuration window which allows you to set host card addresses and IRQ levels. See page 73 .
Software Device Drivers >	Displays the Software Driver Device selections window which allows you to select a software device driver type to display. See page 73 .
Apply Changes & Exit DCU >	Apply configuration changes and exit the Hardware Device Configuration Utility. See page 73 .
Exit DCU and Cancel Changes >	Exit the Hardware Device Configuration Utility and cancel any changes. See page 73 .

config.rio

Under the SCO UnixWare operating system, RIO includes an application for configuring ports called **config.rio**. Config.rio provides a real time map of your system showing the Remote Terminal Adaptors, link cables and host cards and so forth that make up your system.

Main window



See the following sections for details of config.rio menus;

- [Main menu](#) on page [220](#)
- [RTA Management menu](#) on page [222](#)
- [Host Configuration menu](#) on page [224](#)

Main menu

For information on displaying this menu, see [Main window](#) on page 219

Menu option	Description
Change Hosts	Selects the host card whose configuration map you want to display. Use this when you have multiple host cards installed in your machine. See also page 79 .
Delete an RTA	Removes the currently selected RTA from the system. See also page 83 .
View / edit default values	Changes the default settings of a port. Default settings are used when an RTA is added to your system.
Change all TTYS to default values	Change all port configuration values back to their default settings.
Write RTA into file	Allows you to save the current RTA configuration settings as an ASCII text file. You can find the file in /etc/rio/rta_info .
Identify RTAs	Allows you to identify each RTA in your system by flashing the LEDs on all RTAs in a different pattern for each unit.
Reset host interconnections	Re-acquires RTAs in a dual host failsafe system. Use this option to reset the RTAs following the failure of one of the hosts.
Update configuration file	Updates your system configuration file with the latest settings without having to quit config.rio.

Menu option		Description
Boot mode: >	Boot all RTAs	Allows you to select which RTAs in your system are booted on startup when using a dual host failsafe configuration.
	Boot owned RTAs	
	Boot no RTAs	
Create Port Monitor Entries		Allows you to copy riomon entries when adding ports to monitors.

RTA Management menu

For information on displaying this menu, see [Main window](#) on page 219

Menu option		Description
View RTA settings		Displays the configuration of the currently selected RTA. See also page 80 .
Configure RTA		Allows you to configure TTYs and give a name to the currently selected RTA. See also page 80 .
View / edit TTY > Note this option is only displayed after the selected RTA has been configured.	TTY type	Selects the type of terminal connected to the current selected port.
	Chars/sec	Sets the transparent print speed.
	Force ixon	Forces software flow control on a port when enabled.
	Force -ixany	Some applications enable the stty ixany feature which allows any character to be accepted as an xon to the port. By default, the RIO driver prevents the use of ixany (that is, it sets the -ixany flag), and this parameter is set to Yes . To use ixany , set this field to No .
	Lock settings	Allows you to prevent the hardware characteristics of a port being changed. It also saves the port settings across closes (but not across reboots).

Menu option		Description
View / edit TTY > (continued) Note this option is only displayed after the selected RTA has been configured.	Store settings	
	Drain settings	
	Resume output	
	Show port settings	
	Show modem pin settings	
	Port diagnostics	
	Port statistics >	Gather port statistics
		Reset port statistics
Show port statistics		
Edit ID Name		
Re-boot RTA		
Zombie RTA		
Identify RTA		

Menu option		Description
RTA bound to host >	Yes	Allows the selected RTA to be booted along with the rest of the RIO system for a given host card.
	No	Excludes the selected RTA from being booted along with the rest of the RIO system for a given host card.

Host Configuration menu

For information on displaying this menu, see [Main window](#) on page 212

Menu option	Description
View Host card settings	Displays the current connections to the host card.
Edit ID Name	Allows you to edit the host card name.

spxadmpport utility for configuring ports

spxadmpport

spxadmpport is provided to simplify the process of creating port logins on RIO ports. You can use it in place of the **sacadm** and **pmadm** commands. You do this by typing a single line command which contains the information required for a given configuration task using the following syntax;

Syntax /etc/spxadmpport **command svctag [label] [owner]** where;

Item	Description	Example
command	add, enable, disable, remove or list .	remove
svctag	device number from /dev/term.	r01
label	/etc/ttydefs entry (optional).	9600
owner	user ID assigned to the port (optional).	root

Procedure

To use the **spxadmpport** script to configure your RIO serial ports proceed as follows;

1. At the command prompt, type one of the commands detailed in the next table using the syntax /etc/spxadmpport [**command**] [**svctag**] [**label**] [**owner**]

Command	Description	Example command
Add	Adds a serial port to the service monitor (riomon) and enables the port for monitoring logins.	/etc/spxadmpport add r001 9600 root
Enable	Enables a previously disabled port for monitoring.	/etc/spxadmpport enable
Disable	Disables a port. Has the effect of disabling all further logins on this port.	/etc/spxadmpport disable r001
Remove	Removes the selected serial port from the service monitor (riomon).	/etc/spxadmpport remove r001
List	Lists the currently defined services and/or port monitors.	/etc/spxadmpport list
List p	Lists all logins configured.	/etc/spxadmpport list p
List s	Lists all port services configured.	/etc/spxadmpport list s

2. Press the **Enter** key.

The revised RIO port configuration is now adopted by the system.

Window NT utilities

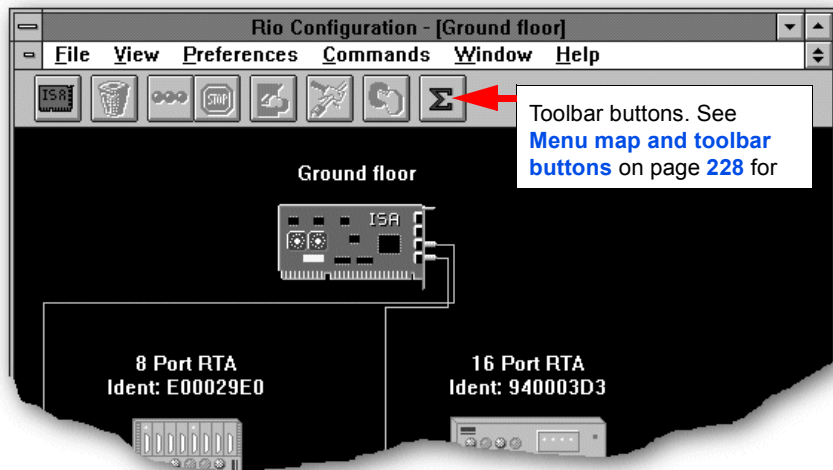
RIO Configuration utility

The RIO Configuration utility is provided for use with the Windows NT operating system. See the following sections for information about main windows and menus;

- [Main window](#) on page [227](#)
- [Menu map and toolbar buttons](#) on page [228](#).








Main window


The main window for the RIO Configuration tool is shown in the next picture. See [page 228](#) for details of menus.



Menu map and toolbar buttons

The RIO Configuration tool menu is as follows;

Menu option		Toolbar icon	Description
File >	Print	None	Prints a copy of the system map. See page 100
	Print Preview		Displays the print preview for printing using the Print menu option.
	Print Setup		Displays the printer setup window.
	Exit		Exits from the RIO Configuration utility.
View >	Toolbar	None	Displays or hides the toolbar on the RIO Configuration window.
	Status bar		Displays or hides the status bar on the RIO Configuration window.
Preferences >	Default	None	Sets the default values for the RIO Configuration utility. See page 96 .
Commands >	Configure		Displays the window for configuring an RTA. See page 96 .
	Zombie		Disconnects an RTA from the system without physically unplugging it (known as zombieing). See page 105 .
	Reboot		Re-boots the selected RTA through the Configuration Utility, without going to the RTA unit. See page 106 .
	Identify		Displays the identity of an RTA on the system map. See page 101 .
	Stop identify		Disables the identify feature. See page 101 .
	Remove		Removes the selected RTA from the system. See page 105 .
	Add ISA host card		Displays the window for configuring an ISA host card prior to actual installation. See page 92 .

Menu option		Toolbar icon	Description
Windows >	Cascade	None	Tiles or cascades the display of RIO Configuration windows as required.
	Tile Vertically		
	Tile Horizontally		
	Summary		Displays a summary of configuration settings for each port. See page 102 .
Help >			Displays the available help information.

Chapter 5 RIO command line utilities

You need to read this chapter if you want to...

You need to read this chapter if you want information in quick reference form about the utilities provided with the RIO serial connectivity system.

This chapter provides a quick reference guide to the command line utilities, system commands and rio.cf file provided with the RIO system.

This chapter includes the following sections;

- [Command line utilities](#) on page [231](#)
- [RIO system commands under Solaris/Linux/LynxOS](#) on page [233](#)
- [rio.cf file](#) on page [245](#)

Command line utilities

This section includes the following;

- [rioisacfg utility](#) on page 231
- [rioconfig utility](#) on page 232
- [RIO system commands under Solaris/Linux/LynxOS](#) on page 233

rioisacfg utility

Operating systems Available under: Solaris.



The **rioisacfg** utility allows you to define addresses and IRQ levels for RIO host cards you add to the system. The command syntax for this utility is as follows;

rioisacfg [-n<name>] [-m<addr>] [-i<irq>] [-p] [-a<ioaddr>] [-d<name>]

Where:

Command	Description
-n<name>	Specifies the host card name
-m<addr>	Specifies host card memory address
-i<irq>	Specifies host card interrupt level
-p	Toggles the state of polling
-a<ioaddr>	Specifies the host card i/o address
-d<name>	Deletes the named host card entry
-l	Lists the current configuration

Some typical example commands are shown below;

Example command	Description
/etc/rioisacfg -n ISA1 -m 0xD0000 -i 9	Set host card parameters.
rioisacfg -p	Sets polling.
rioisacfg -d ISA1	Deletes an ISA card.

For information on using the **rioisacfg** utility to assign host card addresses and IRQ levels, see [Assigning ISA host card addresses and IRQ levels](#) on page 39 in [Chapter 2 Installing hardware and software](#).

rioconfig utility

Operating systems Available under: Solaris.



The **rioconfig** utility allows you to update the RIO system configuration after you have made changes to the system hardware. For example, adding or removing host cards or RTAs.







To run this utility, simply type **rioconfig** at the command prompt then press the **Enter** key.

Under the Solaris operating system the **rioconfig clean** option is also available which causes port device nodes to be created for newly attached RTAs and also deleted for removed RTAs.

For information on using this utility to update the RIO system configuration, see [Updating your RIO system configuration](#) on page 49 in [Chapter 2 Installing hardware and software](#).

RIO system commands under Solaris/Linux/LynxOS

The following RIO system commands allow you to perform management functions with the RIO network. The commands use the settings stored within the rio.cf ASCII file (which is user editable). The commands are summarised in the next table.

Operating systems	Command	For details see...
  	rioreboot	rioreboot on page 234 .
	rioversion	rioversion on page 235 .
	rioboot	rioboot on page 236 .
	rioadopt	rioadopt on page 237 .
	riodelete	riodelete on page 238 .
	rioidentify	rioidentify on page 239 .
	riomkdev	riomkdev on page 241 .
	rioshow	rioshow on page 243 .
	riolock	riolock on page 240 .
	rioresume	rioresume on page 240
 	riostats	riostats on page 244

For details of the format of the **rio.cf** file, see [About the rio.cf file](#) on page [245](#).

rioreboot

Operating systems Available under: Solaris, Linux and LynxOS.



Function Reboots a specified RTA. Equivalent to power-cycling the device.

Syntax `rioreboot [-h] [-v] <name or unique num>`

`rioreboot [-v] -n`

Argument descriptions

Argument	Description
<code>[-h]</code>	Prints a usage message.
<code>[-v]</code>	Displays information about the current progress of a reboot.
<code>-n</code>	Reboots any network interconnected RTA's present on the network.

Examples `rioreboot 0x94000c1e` reboots the RTA with the unique ID `0x94000c1e`.

`rioreboot -n` reboots all RTAs connected to another host card. Typically this is used with Dual Host Failsafe when transferring control to a slave host card.

rioversion

Operating systems Available under: Solaris, Linux and LynxOS.



Function Displays the current version information of the installed driver.

Syntax rioversion [-h] [-v]

Argument descriptions

Argument	Description
[-h]	Prints a usage message.
[-v]	Prints error messages to the standard error file description.

Examples **rioversion** displays driver version information in the format :
RIO Driver - Release 1.1.0 Aug 17 1999, 16:52:58

rioboot

Operating systems Available under: Solaris, Linux, and LynxOS.



Function Boots the host cards and RTAs, to generate and apply rio.cf settings.

Syntax

```
rioboot [-c file] [-h] [-v] [-s]
```

```
rioboot [-c file] [-h] [-v] -u
```

```
rioboot [-c file] [-h] [-f] [-v] -w
```

```
rioboot [-c file] [-h] [-f] [-v] -a
```

Argument descriptions

Argument	Description
[-c file]	Specifies an alternate configuration file.
[-h]	Prints a usage message
[-v]	Reports any anomalies or errors to the standard error file descriptor.
[-s]	Performs a syntax check on the configuration file.
-u	You can use the rioboot -u command to update the driver with any changes that have been made to the configuration file after the driver has been initialised.
[-f]	Forces the Driver to attempt to boot even if no configuration file exists.
-w	You can use the rioboot -w command to output the current configuration of the driver in the format of the configuration file.
-a	Outputs the current configuration to stdout (same as -w), but automatically allocates unassigned RTA system port numbers.

Examples **rioboot -f** boots the RIO driver, even if no **rio.cf** file exists. Typically this is used during system installation or initialisation scripts.

rioboot -w outputs the current configuration to stdout, typically redirected into a configuration file such as **rio.cf**.

rioboot -u updates the driver settings with any changes made to the **rio.cf** file.

rioadopt

Operating systems Available under: Solaris, Linux and LynxOS.



Function Transfers settings from an RTA removed from the system to a newly installed RTA.

Syntax rioadopt [-c file] [-h] [-v] -r

rioadopt [-c file] [-h] [-v] -i

Argument descriptions

Argument	Description
[-c file]	Specifies an alternate configuration file for read and write.
[-h]	Prints a usage message.
[-v]	Sends Error messages and warnings to the standard error file description.
-r	Selects "report only" mode.
-i	Causes rioadopt to operate interactively

Examples **rioadopt -r** generates a report of missing RTAs and newly reported RTAs, similar to following:

```
rioadopt:
Missing RTA ID : 994001b0
Missing RTA ID : 94000f0f
New RTA ID : 94000f0f
```

riodelete

Operating systems Available under: Solaris, Linux and LynxOS.



Function Removes settings for specified RTA(s).

Syntax riodelete [-f] [-h] [-v] <name or unique num>

Argument descriptions

Argument	Description
[-f]	If an RTA is currently attached and booted then the command will not delete it unless the user has specified the -f option. This option will force the deletion of the device by removing it from the network and then requesting the RIO driver to delete its entry. The RTA is removed from the network by placing the RTA software in an infinite loop.
[-h]	Prints a usage message to the standard error file descriptor
[-v]	Sends all messages to the standard error file descriptor.

Example **riodelete 0x94000C1e** removes the settings for RTA with unique ID **0x94000c1e**.

rioidentify

Operating systems Available under: Solaris, Linux and LynxOS.



Function Locates a particular RTA (by flashing it's LEDs).

Syntax `rioidentify [-h] [-v] <name or unique num>`

*Argument
descriptions*

Argument	Description
[-h]	Prints a usage message.
[-v]	Causes the command to print error messages to the standard error file descriptor.

Examples **`rioidentify 0x94000C1e`** causes the RTA with unique ID **`0x94000c1e`** to flash its LEDs.

riolock

Operating systems Available under: Solaris.



Function Locks settings for a specified device.

Syntax riolock ttyname

Example To lock the settings of device **/dev/term/r001** preventing further changes to system settings, use:

riolock /dev/term/r001

rioresume

Operating systems Available under: Solaris.



Function unlocks settings for a specified device.

Syntax rioresume ttyname

Example To unlock the settings of device **/dev/term/r001** use:

rioresume /dev/term/r001

riomkdev

Operating systems Available under: Solaris, Linux and LynxOS.



Function Generates or deletes system port devices from the rio.cf settings.

Syntax `riomkdev [-c file] [-f] [-h] [-rname or unique num] [-v]`

`riomkdev [-c file] [-f] [-h] [-rname or unique num] [-v] -x`

`riomkdev [-c file] [-f] [-h] [-rname or unique num] [-v] -d`

Argument descriptions

Argument	Description
<code>[-c file]</code>	Specifies an alternative configuration file.
<code>[-f]</code>	Unlinks any existing device nodes before the new devices are created.
<code>[-h]</code>	Prints a usage message and exits.
<code>[-rname or unique num]</code>	Specifies the RTA whose devices should be created or deleted.
<code>[-v]</code>	Sends error messages and warnings to the standard error file descriptor.
<code>-x</code>	Create or deletes transparent print devices.
<code>-d</code>	Deletes all specified devices if they exist.

Examples **riomkdev -f** creates port device nodes for all RTAs and ports specified in the `/etc/rio/rio.cf` file. Typically this is used by the `/etc/rioconfig` script to automatically generate device nodes for newly attached RTAs.

Solaris When using `riomkdev` under Solaris please note the following

Solaris

The RIO Solaris driver generates terminal, modem and transparent print device nodes for each specified terminal device. That is, for a specified terminal device `/dev/term/r001`, the following devices nodes are generated:

`/dev/term/r001` for a terminal device

`/dev/cua/r001` for a modem device

`/dev/xprt/r001` for a transparent print device

Linux

When using riomkdev under Linux please note the following;

Linux

The RIO Linux driver generates terminal and modem device nodes for each RTA specified in the **rio.cf** file ([page 245](#)). Thus for a specified RTA, the following device nodes are created;

/dev/ttySRx for a terminal device

/dev/cusrx for a modem device

The Linux driver does not support transparent printing.

rioshow

Operating systems Available under Solaris, Linux and LynxOS



Function Displays the current list of host cards and RTAs in the system.

Syntax rioshow [-s] [-h] [-v]

Argument descriptions

Argument	Description
[-s]	Inhibits the display of the column headings.
[-h]	Prints a usage message.file descriptor.
[-v]	Causes the command to print error messages to the standard error file descriptor.

Example **rioshow** generates a report of the installed host cards and RTAs similar to the following:

```

Unique
Num      ID   Ports      Name
a5000387 0    -1   -   -1  HOST 1
94000c1e  1     0   -   15  UNKNOWN RTA 2-
                        1
94000a42  1    16   -   31  UNKNOWN RTA 2-
                        3
e8ff84ad  1    32   -   39  UNKNOWN RTA 2-
                        5
  
```

riostats

Operating systems Available under Solaris and LynxOS



Function Displays internal driver statistics.

Syntax riostats [-h] [-v] [-e] ttyname

riostats [-h] [-v] [-d] ttyname

Argument descriptions

Argument	Description
[-h]	Prints a usage message.
[-v]	Sends error messages and warnings to the standard error file descriptor.
[-e]	Enables driver statistics gathering.
[-d]	Disables driver statistics gathering.

Examples **riostats -e /dev/term/r001** enables statistics gathering on device **/dev/term/r001**.

riostats /dev/term/r001 displays a statistics report for devices **/dev/term/r001** similar to the following:

```

OPEN  CLOSE  RX    TX
1      0      6    112

```

riostats -d /dev/term/r001 disables statistics gathering on device **/dev/term/r001**.

rio.cf file

This section describes the rio.cf file and includes the following;

- [About the rio.cf file](#) on page 245
- [rio.cf keywords](#) on page 247

About the rio.cf file

The **rio.cf** file is an administration file containing configuration information for the RIO devices and drivers and is stored under **/etc/rio/rio.cf**. The rio.cf file is used by RIO utilities to obtain or specify information about the RIO system.

The file information is structured as shown in the example, each line begins with a keyword: HOST, RTA or PORT. One further keyword: DEFPORT is used to define default settings for all undefined ports. These keywords are then followed by various configuration fields separated by ":". If a field is left blank, then the default value for that field is used. Lines beginning with "#" are treated as comment lines.

See [rio.cf keywords](#) on page 247 for more details about each keyword.

A typical example of a **rio.cf** file is shown in the next picture.

Defines an RTA entry.
See [page 248](#)

Defines the settings for a particular port.
See [page 249](#)

Defines a host card entry.
See [page 248](#)

Defines the default port settings.
See [page 251](#)

```

Terminal
Window Edit Options Help
#
# Current RIO driver configuration.
# File Created : Fri Aug 13 09:50:40 1999
#
# Host entry format is:
# HOST:<unique id>:<Device Name>:<boot/noboot>:
#
# Rta entry format is:
# RTA:<unique id>:<Device Name>:<First Port>:<boot/noboot>:
#
# Port entry format is:
# PORT:<offset>:<tty dev>:<xp dev>:<xcps>:<xpon>:<xpoff>:ixany,ixon,lock,store,d
rain:
#
# Default port format is:
# DEFPORT:<offset>:<dev prfx>:<xp dev prfx>:<tty/modem>:<xcps>:<xpon>:<xpoff>:ix
any,ixon,lock,store,drain:
#
#
DEFPORT:ixany:
HOST:aa000015:HOST 1:boot:
RTA:994001b0:RTA 1-1:8:boot:
PORT:0::tty::::

HOST:a5000387:HOST 2:boot:
RTA:e300069c:RTA 2-1:0:boot:
PORT:0::tty::::
#

```

rio.cf keywords

This section provides information about the following keywords;

- **HOST** on page **248**
- **RTA** on page **248**
- **DEFPORT** on page **249**
- **PORT** on page **251**

HOST

Function Defines a host card entry

Example `HOST:<unique id>:<Device Name>:<boot/noboot>`

Field descriptions

Field	Description
<unique id>	Unique number defining the host card in the system (read only)
<Device Name>	String defining the friendly name of the host card in the system (user read/write)
<boot/noboot>	<p>Boot flag containing the string "boot" or "noboot". (user read/write, default = "boot")</p> <p>If set to "boot", the device driver will attempt to boot the card.</p> <p>If set to "noboot", the device driver will not boot the card.</p>

RTA

Function Defines a Remote Terminal Adaptor entry

Example `RTA:<unique id>:<Device Name>:<First Port>:<boot/noboot>`

Field descriptions

Field	Description
<unique id>	Unique number defining the RTA in the system (read only)
<Device Name>	String defining the friendly name of the RTA in the system (user read/write)
<First Port>	Defines the system port number to be assigned to the first port (user read/write) of the RTA. Value must be 8 or 16 aligned in a range from 0 to 504, for example, 0, 8, 16, 24 etc.
<boot/noboot>	<p>Bootflag containing string "boot" or "noboot". (user read/write, default = "boot")</p> <p>If set to "boot", the device driver will attempt to boot the RTA.</p> <p>If set to "noboot", the device driver will not boot the RTA.</p>

DEFPORT

Function Defines the default settings for ports

Example

```
DEFPORT:<offset>:<dev prfx>:<xp dev prfx>:<tty modem>:<xcps>:<xpon>:<xpoff>:ixany,ixon,lock,store
```

Field descriptions

Field	Operating systems	Description
<offset>	Available under Solaris and Linux.	Defines an offset added to each system port when defining the default name for a device using the riomkdev utility. Solaris: Default = 1 Linux: Default = 0
<dev prfx>		ANSI C "printf" style string defining the default name for a device. Used by riomkdev when creating device names for ports. Solaris: The default of "/dev/term/r03%d" will give the name /dev/term/r006 to system port 5 (0 based). Linux: The default of "/dev/ttySR%d" will give you the name /dev/ttySR5 to system port 5.
<xp dev prfx>	Solaris only. Not available under Linux.	ANSI C "printf" style string defining the default name for a (user read/write, default = "/dev/xprt/r03%d") transparent print device used by riomkdev when creating device names for transparent printing ports. For example, if default prefix = "/dev/xprt/r03%d", then system port 6 will have the name "/dev/xprt/r006".
<tty/modem>		Defines device type and contains string "tty" or "modem" defining the type of default device (user read/write, default = "tty") to be created.
<xcps>		Decimal number defining the number of characters (user read/write, default = 100) per second rate for transparent print data through a terminal. Valid values are in the range 10 to 1000.
<xpon>		String defining the "transparent print on" escape sequence sent (user read/write, default = "XPON") to re-direct transparent print data through a terminal. (A "A" character is used to generate control characters, for example, "A[" = 0x1B).
<xpoff>		String defining the "transparent print off" escape sequence sent (user read/write, default = "XPOFF") to stop re-direction of transparent print data through a terminal. (A "A" character is used to generate control characters, for example, "A[" = 0x1B).

Field	Operating systems	Description
<code>ixany</code>	Available under Solaris and Linux.	Always open port with termio flag, ixany set.
<code>ixon</code>		Always open port with termio flag, ixon set.
<code>lock</code>		Locks port settings, and disallows further configuration attempts using termio .
<code>store</code>		Store port settings across closes.
<code>drain</code>	Solaris only. Not available under Linux.	When set, this flag causes the port to wait until data transmission and reception has finished before closing the port. If not set the port will wait for up to 15 seconds for the data to drain and then close.

PORT

Function Defines the settings for a particular port

Example `PORT:<offset>:<tty dev>:<xp dev>:<xcps>:<xpon>:<xpoff>:ixany,ixon,lock,store,drain:`

Field descriptions

Field	Operating systems	Description
<offset>	Available under Solaris and Linux.	Defines the system port offset with respect to the owning RTA. (user read/write, must be set).
<tty dev>		String defining the system name for the device (user read/write, default based on DEFPORT settings) used by riomkdev when creating device names for ports.
<xp dev>	Solaris only. Not available under Linux.	String defining the system name for a transparent print device (user read/write, default based on DEFPORT settings) riomkdev when creating device names for transparent printing ports.
<xcps>		Decimal number defining the number of characters (user read/write, default = 100) per second rate for transparent print data through a terminal. Valid values are in the range 10 to 1000.
<xpon>		String defining the "transparent print on" escape sequence sent (user read/write, default = "XPON") to re-direct transparent print data through a terminal. (A "^" character is used to generate control characters, for example, "^[" = 0x1B).
<xpoff>		String defining the "transparent print off" escape sequence sent (user read/write, default = "XPOFF") to stop re-direction of transparent print data through a terminal. (A "^" character is used to generate control characters, for example, "^[" = 0x1B).
ixany	Available under Solaris and Linux.	Always open port with termio flag, ixany set.
ixon		Always open port with termio flag, ixon set.
lock		Locks port settings, and disallows further configuration attempts using termio .
store		Store port settings across closes.
drain	Solaris only. Not available under Linux.	When set, this flag causes the port to wait until data transmission and reception has finished before closing the port. If not set the port will wait for up to 15 seconds for the data to drain and then close.

Appendix A Serial port device names

You need to read this appendix if you want to... You need to read this appendix if you want information about device names for the Perle RIO serial connectivity system.

This appendix provides information about the device nodes associated with each serial port for the Perle RIO serial connectivity system. Included are naming conventions, functions and file locations.

This appendix includes the following sections;

- [Solaris Device node details](#) on page **253**
- [Linux Device node details](#) on page **253**

Solaris Device node details

Each serial port has three device nodes associated with it. Each node takes the form of a file which you can access from operating system utilities and user applications. Details of these nodes are shown in the next table.

Device name	Function	Description	Location
r001	Normal communications port	Indicates normal communications port behaviour.	/dev/term
r001	Normal communications port wait for DCD on open	Indicates a port open will not complete unless the DCD signal is present.	/dev/cua
r001	Print device	Indicates that device should only be used for transparent print.	/dev/xprt

Linux Device node details

Each serial port has two device nodes associated with it. Each node takes the form of a file which you can access from operating system utilities and user applications. Details of these nodes are shown in the next table.

Device name	Function	Description	Location
ttySR0	Normal communications port	Indicates normal communications port behaviour.	/dev
cusr0	Normal communications port wait for DCD on open	Indicates a port open will not complete unless the DCD signal is present.	/dev

Appendix B Transparent printing (Solaris only)

You need to read this appendix if you want to...

You need to read this appendix if you want background information on transparent printing.

This appendix gives an overview of the transparent printing feature offered for the Solaris operating system and includes details of configuration files associated with transparent printing.

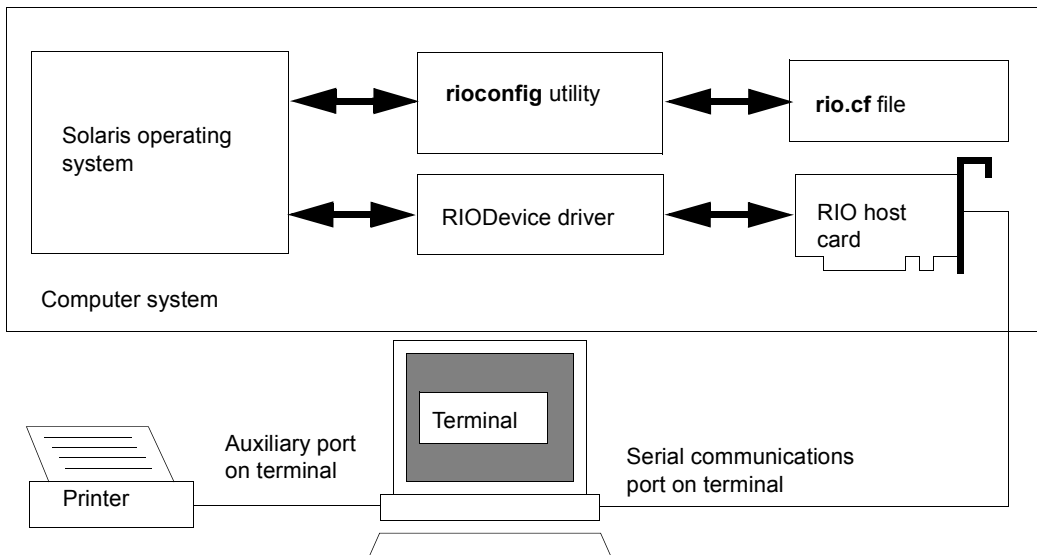
This appendix includes the following sections;

- [What is transparent printing?](#) on page [255](#)
- [Problems with printer output](#) on page [256](#)
- [Sample transparent printing "rio.cf" port entry](#) on page [257](#)
- [Common Terminal Transparent Print Sequences](#) on page [258](#)

What is transparent printing?

Most terminals have an auxiliary (AUX) port which can be connected to a serial printer. Data can then be output to the terminal or the printer via the same serial line. This is called **transparent print** (or xprint) and is designed for printing simple ASCII text.

A separate xprint device node (/dev/xprt/r00n where n is device number) is created for each port. This device is enabled automatically if either the local or modem device is enabled for the port.



When a host card receives data addressed to the transparent print device it prefixes it with the transparent print mode ON string and appends it with the transparent mode OFF string. The ON and OFF strings for each terminal type available are defined by the **rio.cf** file. See [Appendix B rio.cf administration file](#) for more details.

Terminal I/O has absolute priority over printer output. Transparent print data will only be sent when there is a break in output to the terminal (for more than a tenth of a second)

For each port, the transparent printing parameters are controlled by an entry in the **rio.cf** file found in the /etc/rio directory on your system. The entry for each port includes definitions of the terminal type, transparent print throughput rate and device name. See [Appendix B rio.cf administration file](#) for further details.

Problems with printer output

When you use transparent printing you may obtain incorrect printer output due to the following reasons;

Graphics printers may misinterpret some characters output through transparent print. This problem is more likely if the terminal is in 7-bit mode, because 8-bit characters will not be printed.

Some terminals suppress the output of certain characters to their printer or AUX ports. Such terminals can prevent essential control characters from reaching the printer thus generating incorrect printer output. This occurrence is extremely unpredictable because of the large number of potential hardware configurations.

Sample transparent printing "rio.cf" port entry

A typical port entry in the rio.cf file defining transparent print settings (for a wyse 60 terminal) is as follows:

Note

If the terminal device name is **/dev/term/r006**, then the transparent print device name is **/dev/xprt/r006**. This is generated automatically by the Solaris operating system.

Note

A **^** character is used to escape the next character, that is **^[** is **escape** = 0x1B.

PORT:0:/dev/term/r006::tty:100:^[d#:^T::

Terminal name.

100 defines the characters-per-second rate at which transparent print data is sent through the terminal.

^[d# defines the transparent-print-on sequence use to prefix transparent print data sent to a wyse 60 terminal.

^T defines the transparent-print-off sequence use to suffix transparent print data sent to a wyse 60 terminal.

Common Terminal Transparent Print Sequences

Terminal	XPON	XPOFF
wy60	^[d#	^T
wy50	^[d#	^T
tv925	^[^[a
wspc65	^[[5i	^[[4i
vt220	^[[5i	^[[4i

Appendix C Troubleshooting

You need to read this appendix if you want to... You need to read this appendix if you want information on troubleshooting for the RIO serial connectivity system.

This appendix provides examples of normal boot up messages and a troubleshooting guide including typical problems and corrective action required for all the currently supported operating systems.

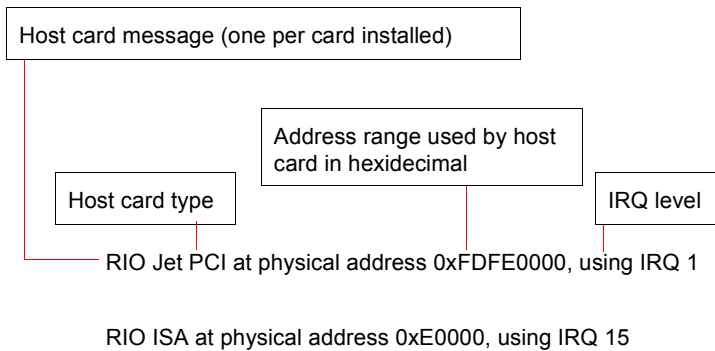
This appendix includes the following sections;

- [Solaris troubleshooting](#) on page [260](#).
- [SCO OpenServer 5 troubleshooting](#) on page [264](#)
- [SCO UnixWare troubleshooting](#) on page [275](#)
- [Windows NT troubleshooting](#) on page [285](#).

Solaris troubleshooting

Example of normal boot up messages for host cards

The normal messages for satisfactory host card detection and initialisation form part of the normal Solaris boot up messages and are shown in the next example. This example shows one ISA host card and one PCI host card.



Troubleshooting guide

This section includes the following;

- [Host cards](#) on page [261](#)
- [Remote Terminal Adaptors \(RTAs\)](#) on page [262](#)
- [Ports](#) on page [263](#).

Host cards

Problem	Action required
Device driver does not start after installation	<ol style="list-style-type: none"> 1. Ensure PCI host cards have been installed. See page 142. 2. Ensure ISA card settings have been specified. See page 143.
Host card not recognised by system	<ol style="list-style-type: none"> 1. Check physical installation of PCI and ISA host cards, and ensure board correctly seated in bus slot. See page 142 and page 143. 2. Check ISA board memory settings, and ensure they match the setting specified by the rioisacfg file during installation. See page 143. 3. Check the interrupt setting on ISA host cards, to see if the interrupt specified by the rioisacfg file during installation is available for ISA use. See page 39. <p>Note that on most systems it is a requirement that ISA interrupts are reserved in either the BIOS setup, or system configuration program.</p>

Remote Terminal Adaptors (RTAs)

Problem	Action required
RTA not recognised by system	<ol style="list-style-type: none"> 1. Check physical connections and power. See page 146. 2. Run the rioconfig utility to update RIO system settings. See page 49.
RTA not booted by system	<ol style="list-style-type: none"> 1. Check the rio.cf file to make sure the RTA entry exists and contains the boot field. See page 164. 2. Delete the rio.cf file and run the rioconfig utility to recreate the system settings. See page 164 and page 49.
RTA8 LED next to port 5 does not light up	The host card has already assigned 128 ports, if you haven't got 128 ports installed, this means that you have previously removed one or more RTAs from the network but not deleted them from the configuration.
RTA16 con LED does not light up	You have already installed the maximum number of RTAs up to 128 ports. This situation may arise if you have previously removed RTAs from the system but forgotten to delete them from the configuration using the rioconfig utility.

Ports

Problem	Action required
Port device nodes not present in the system.	<ol style="list-style-type: none">1. Make sure RTA has been installed correctly. See page 146.2. Run the rioconfig utility to update RIO system settings and create device nodes. See page 49.

SCO OpenServer 5 troubleshooting

This section includes the following;

- [Using the Port Diagnostics facility](#) on page 264
- [SCO OpenServer 5 Error Messages](#) on page 274

Using the Port Diagnostics facility

The Config.rio utility includes an online port diagnostics facility which allows you to investigate port failures and misbehaviour while the system is running. The port diagnostics facility allows you to run the following tests:

Test	Description
Send data to port	Data is written to the port to check output.
External loopback	Sends and receives data on the port then compares the received data with what was sent.

This section includes the following;

- [General procedure for using Port Diagnostics](#) on page 265
- [Selecting the RTA and port to test](#) on page 266
- [Performing the send data to port test](#) on page 270
- [Performing the loopback test on a port](#) on page 272

General procedure for using Port Diagnostics

To perform tests using the diagnostics facility proceed as follows;

1. Select the RTA and port you want to test using the procedures given in [Selecting the RTA and port to test](#) on page [266](#).
2. If required, perform the send data to port test using the procedures given in [Performing the send data to port test](#) on page [270](#).
3. If required, perform the external loopback test using the procedures given in [Performing the loopback test on a port](#) on page [272](#).

Selecting the RTA and port to test

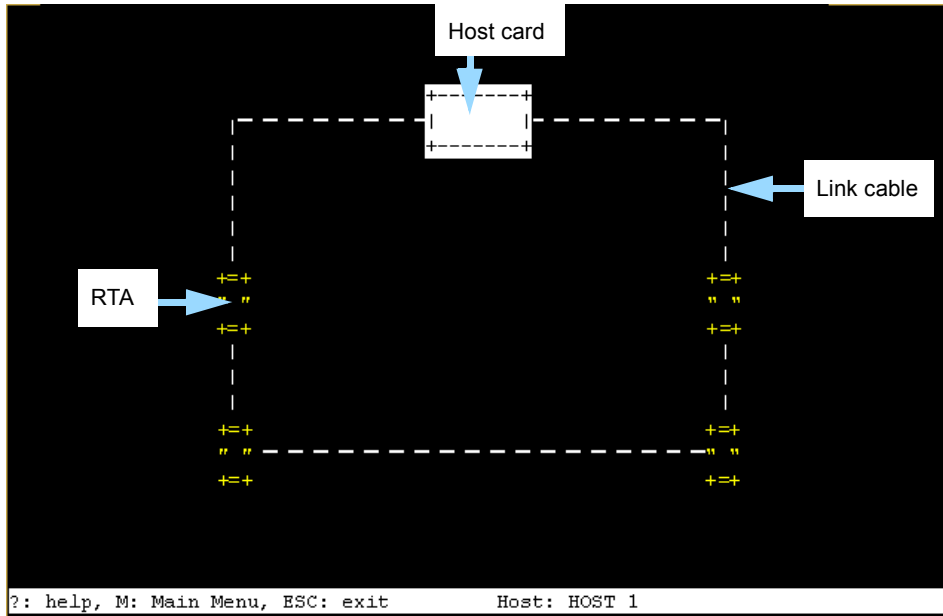
To select the RTA and port to you wish to test proceed as follows:

Note

You should disable any port service active on the port before running the diagnostics.

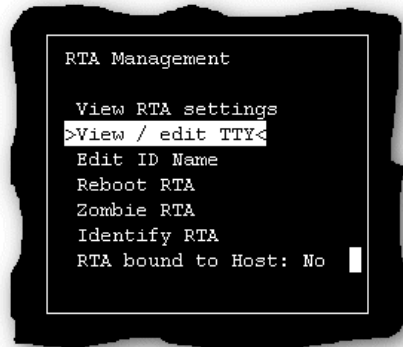
1. Turn on your system and login as super user.
2. At the command prompt, type **config.rio** and press the **Enter** key.

The RIO configuration utility window is now displayed showing a map of your system. See [Configuring ports with config.rio](#) on page 62 for more details about how **config.rio** works.



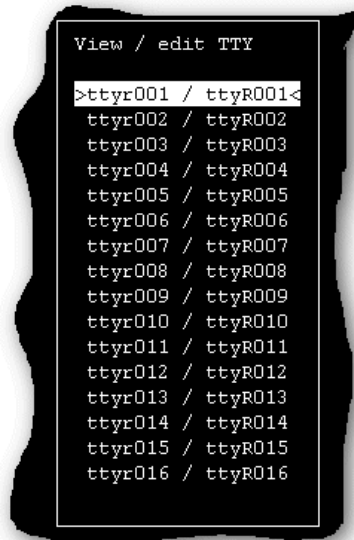
3. In the RIO configuration utility window, move the cursor to the RTA associated with the ports you want to test and press the **Enter** key.

The RTA Management menu is now displayed.



4. In the RTA Management menu, click on **View / edit TTY**.

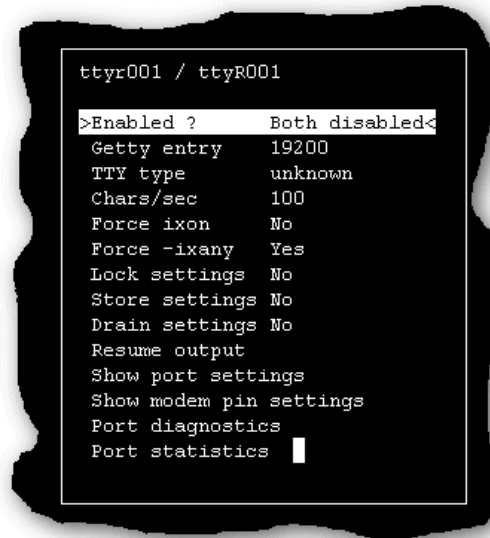
The View / edit TTY window is now displayed as shown in the next picture.



The View / edit TTY window shows a list of ports for the currently selected RTA in the form of TTY blocks.

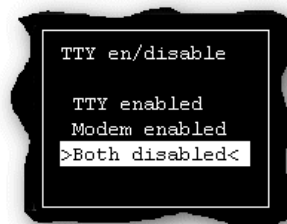
5. In the View / edit TTY window use the up and down arrow keys to select the TTY block for the port you want to test and press the **Enter** key.

The tty menu is now displayed.

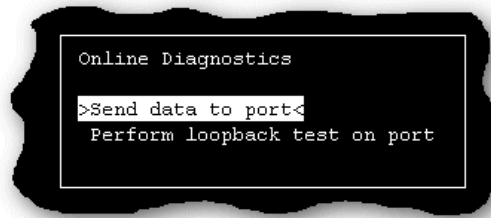


Before proceeding, you need to disable all logins on the port you are going to test to do this;

6. In the tty menu click on **Enabled?** and press the **Enter** key.
The TTY en/disable menu is now displayed,



7. In the TTY en/disable menu, click on **Both disabled** and press the **Enter** key.
8. In the tty menu, click on **Port diagnostics** and press the **Enter** key.
The Online Diagnostics menu is now displayed as shown in the next picture.



9. You can now select and run the type of test you want using the Online Diagnostics menu. See one of the options listed in the next table for further details;

Test	To run this test click on	For details of how to run this test see...
Send data to port	Send data to port	Performing the send data to port test on page 270.
External loopback	Perform loopback test on port	Performing the loopback test on a port on page 272.

Performing the send data to port test

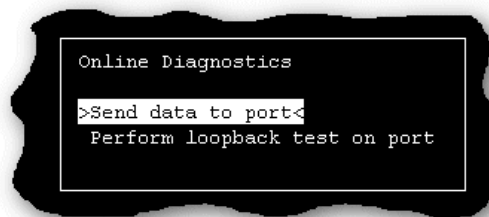
To run the Send data to port test proceed as follows;

Note

Before you can perform this test, you need to select the RTA and port you want using the procedures given in [Selecting the RTA and port to test](#) on page 266.

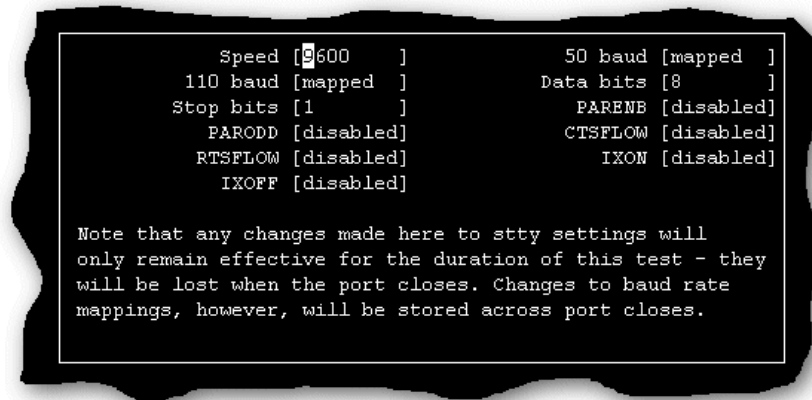
1. In the tty menu, click on **Port diagnostics** and press the **Enter** key.

The Online Diagnostics menu is now displayed as shown in the next picture.



2. In the Online Diagnostics menu, click on **Send data to port**.

A test parameters window is now displayed which allows to set the values required for the duration of the test.



3. In the test parameters window, use the cursor keys to select the value you want to set then cycle through to the value you want using the space bar key.

4. Once you have set all the test parameters you require, press the Enter key to start the test.

The test now runs and displays the test results window shown in the next picture on completion.

Hint

If required, you can halt the test by pressing the **Enter** key.

```
RTA: Ports 1-16
Port: /dev/ttyr001
Port settings: Baud 38400 Data 8 Stop 1 Parity None Flow None
Diagnostic: Write test
Bytes written: 79104
Bytes read: 0
Result:
```

5. Once you have finished viewing the results of your test press the **Enter** key to return to the Online Diagnostics menu.

```
Online Diagnostics
>Send data to port<
Perform loopback test on port
```

Performing the loopback test on a port

To run the loopback test on a port proceed as follows;

Note

Before you can perform this test, you need to select the RTA and port you want using the procedures given in [Selecting the RTA and port to test](#) on page 266.

1. On the RTA containing the port you want to test, connect a loopback connector onto the port to be tested. See [Loopback connector pinouts](#) on page 207 in [Chapter 3 RIO Cabling information](#).
2. In the tty menu, click on **Port diagnostics** and press the **Enter** key.

The Online Diagnostics menu is now displayed as shown in the next picture.

Online Diagnostics

Send data to port

>Perform loopback test on port<

3. In the Online Diagnostics menu, click on **Perform loopback test on port**.

A test parameters window is now displayed which allows to set the values required for the duration of the test.

```

Speed [9600 ]      50 baud [mapped ]
110 baud [mapped ] Data bits [8 ]
Stop bits [1 ]     PARENB [disabled]
PARODD [disabled] CTSFLOW [disabled]
RTSFLOW [disabled] IXON [disabled]
IXOFF [disabled]

```

Note that any changes made here to stty settings will only remain effective for the duration of this test - they will be lost when the port closes. Changes to baud rate mappings, however, will be stored across port closes.

4. In the test parameters window, use the cursor keys to select the value you want to set then cycle through to the value you want using the space bar key.
5. Once you have set all the test parameters you require, press the Enter key to start the test.

The test now runs and displays the test results window shown in the next picture on completion.

Hint

If required, you can halt the test by pressing the **Enter** key.

```
RTA: Ports 1-16
Port: /dev/ttyr016
Port settings: Baud 38400 Data 8 Stop 1 Parity None Flow None
Diagnostic: Loopback test
Bytes written: 36312
Bytes read: 36312
Result: PASSED
```

6. Once you have finished viewing the results of your test, press the **Enter** key to return to the Online Diagnostics menu.

```
Online Diagnostics
>Send data to port<
Perform loopback test on port
```

SCO OpenServer 5 Error Messages

Message	Reason	Action required
FAILED: Timeout on read	Loopback connector, Link cable or power supply has been disconnected during the test. Loopback connector has not been fitted to the port.	1. Check that loopback connector, link cable and power supply are fitted. 2. If the above don't work then contact Technical Support. See Appendix D Contacting Perle .
FAILED: Write fail	RIO is unable to write to the port.	1. Contact Technical Support. See Appendix D Contacting Perle .
FAILED: Read fail	RIO is unable to read from the port.	
FAILED: Data read is different from data written	The data read from the port is different to that written to the port.	

SCO UnixWare troubleshooting

This section includes the following;

- [Using the Port Diagnostics facility](#) on page [275](#)
- [SCO UnixWare Error Messages](#) on page [284](#)

Using the Port Diagnostics facility

The Config.rio utility includes an online port diagnostics facility which allows you to investigate port failures and misbehaviour while the system is running. The port diagnostics facility allows you to run the following tests:

Test	Description
Send data to port	Data is written to the port to check output.
External loopback	Sends and receives data on the port then compares the received data with what was sent.

This section includes the following;

- [General procedure for using Port Diagnostics](#) on page [276](#)
- [Selecting the RTA and port to test](#) on page [277](#)
- [Performing the send data to port test](#) on page [280](#)
- [Performing the loopback test on a port](#) on page [282](#)

General procedure for using Port Diagnostics

To perform tests using the diagnostics facility proceed as follows;

1. Select the RTA and port you want to test using the procedures given in [Selecting the RTA and port to test](#) on page [277](#).
2. If required, perform the send data to port test using the procedures given in [Performing the send data to port test](#) on page [280](#).
3. If required, perform the external loopback test using the procedures given in [Performing the loopback test on a port](#) on page [282](#).

Selecting the RTA and port to test

To select the RTA and port to you wish to test proceed as follows:

Note

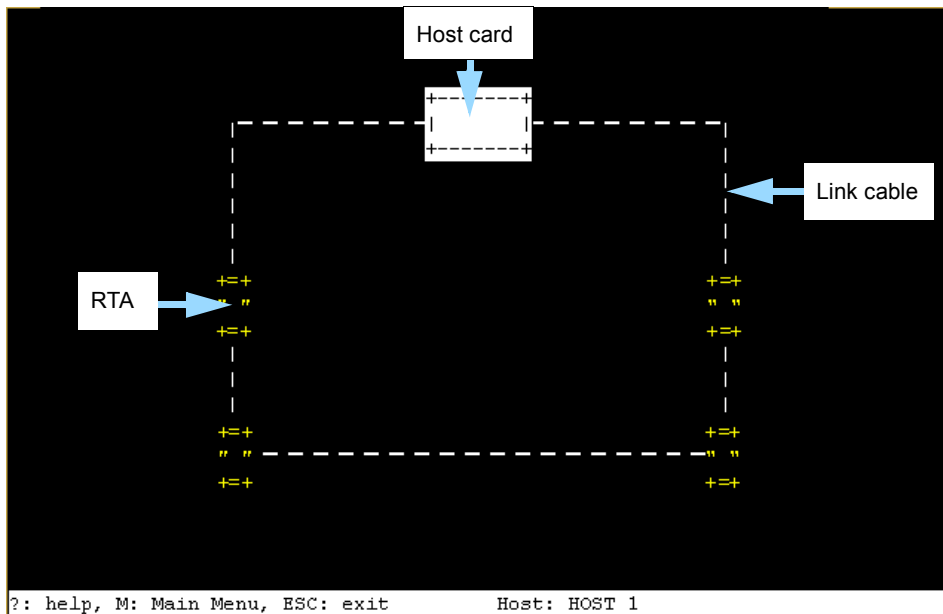
You should disable any port service active on the port before running the diagnostics.

1. Turn on your system and login as super user.
2. Disable the port you wish to test. To do this, at the command prompt type **/etc/spcadmport disable r00x** (when r00x is the port number for example, r001) and press the **Enter** key.

For more information about **spxadmport**, see [spxadmport utility for configuring ports](#) on page 225 in [Chapter 4 Quick Reference](#).

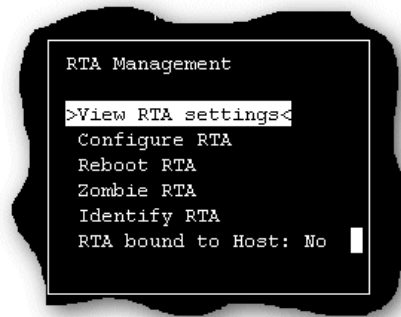
3. At the command prompt, type **config.rio** and press the **Enter** key.

The RIO configuration utility window is now displayed showing a map of your system. See [Configuring ports with config.rio](#) on page 79 for more details about how **config.rio** works.



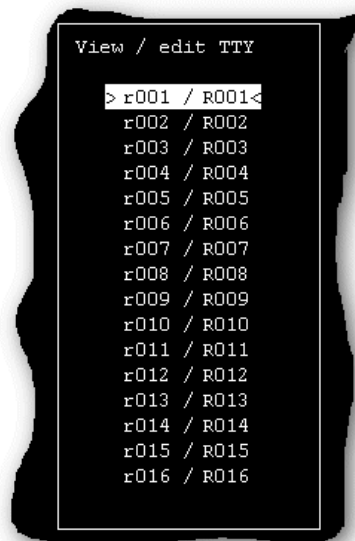
4. In the RIO configuration utility window, move the cursor to the RTA associated with the ports you want to test and press the **Enter** key.

The RTA Management menu is now displayed.



5. In the RTA Management menu, click on **View / edit TTY**.

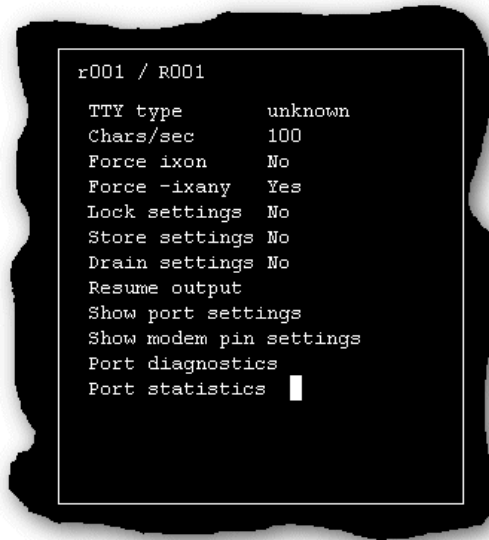
The View / edit TTY window is now displayed as shown in the next picture.



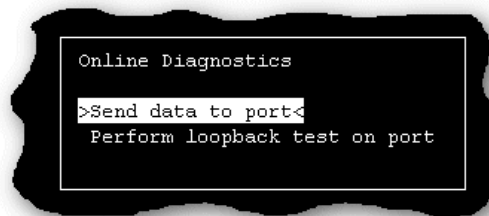
The View / edit TTY window shows a list of ports for the currently selected RTA in the form of TTY blocks.

6. In the View / edit TTY window use the up and down arrow keys to select the TTY block for the port you want to test and press the **Enter** key.

The tty menu is now displayed.



7. In the tty menu, click on **Port diagnostics** and press the **Enter** key.
The Online Diagnostics menu is now displayed as shown in the next picture.



8. You can now select and run the type of test you want using the Online Diagnostics menu.
See one of the options listed in the next table for further details;

Test	To run this test click on	For details of how to run this test see...
Send data to port	Send data to port	Performing the send data to port test on page 280.
External loopback	Perform loopback test on port	Performing the loopback test on a port on page 282.

Performing the send data to port test

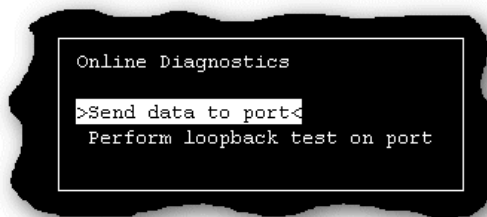
To run the Send data to port test proceed as follows;

Note

Before you can perform this test, you need to select the RTA and port you want using the procedures given in [Selecting the RTA and port to test](#) on page 277.

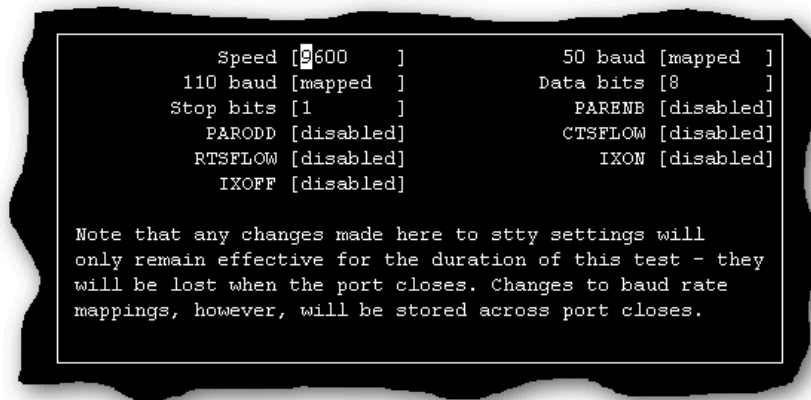
1. In the tty menu, click on **Port diagnostics** and press the **Enter** key.

The Online Diagnostics menu is now displayed as shown in the next picture.



2. In the Online Diagnostics menu, click on **Send data to port**.

A test parameters window is now displayed which allows to set the values required for the duration of the test.



3. In the test parameters window, use the cursor keys to select the value you want to set then cycle through to the value you want using the space bar key.

4. Once you have set all the test parameters you require, press the Enter key to start the test.

The test now runs and displays the test results window shown in the next picture on completion.

Hint

If required, you can halt the test by pressing the **Enter** key.

```
RTA: Ports 1-16
Port: /dev/r001
Port settings: Baud 38400 Data 8 Stop 1 Parity None Flow None
Diagnostic: Write test
Bytes written: 79104
Bytes read: 0
Result:
```

5. Once you have finished viewing the results of your test press the **Enter** key to return to the Online Diagnostics menu.

```
Online Diagnostics
>Send data to port<
Perform loopback test on port
```

6. Press the **Esc** key to return to the main RIO configuration utility window ([page 277](#)) and then press the **Esc** key again to exit the utility.
7. If you have finished running port diagnostics you now need to re-enable the port you have tested. To do this, at the command prompt, type `/etc/spxadimport enable r00x` (when r00x is the port number for example, r001) and press the **Enter** key.

For more information about **spxadimport**, see [spxadimport utility for configuring ports](#) on page [225](#) in [Chapter 4 Quick Reference](#).

Performing the loopback test on a port

To run the loopback test on a port proceed as follows;

Note

Before you can perform this test, you need to select the RTA and port you want using the procedures given in [Selecting the RTA and port to test](#) on page 277.

1. On the RTA containing the port you want to test, connect a loopback connector onto the port to be tested. See [Loopback connector pinouts](#) on page 207 in [Chapter 3 RIO Cabling information](#).
2. In the tty menu, click on **Port diagnostics** and press the **Enter** key.

The Online Diagnostics menu is now displayed as shown in the next picture.

Online Diagnostics

Send data to port

>Perform loopback test on port<

3. In the Online Diagnostics menu, click on **Perform loopback test on port**.

A test parameters window is now displayed which allows to set the values required for the duration of the test.

```

Speed [9600 ]      50 baud [mapped ]
110 baud [mapped ] Data bits [8 ]
Stop bits [1 ]     PARENB [disabled]
PARODD [disabled] CTSFLOW [disabled]
RTSFLOW [disabled] IXON [disabled]
IXOFF [disabled]

```

Note that any changes made here to stty settings will only remain effective for the duration of this test - they will be lost when the port closes. Changes to baud rate mappings, however, will be stored across port closes.

4. In the test parameters window, use the cursor keys to select the value you want to set then cycle through to the value you want using the space bar key.
5. Once you have set all the test parameters you require, press the Enter key to start the test.

The test now runs and displays the test results window shown in the next picture on completion.

Hint

If required, you can halt the test by pressing the **Enter** key.

```
RTA: Ports 1-16
Port: /dev/r016
Port settings: Baud 38400 Data 8 Stop 1 Parity None Flow None
Diagnostic: Loopback test
Bytes written: 36312
Bytes read: 36312
Result: PASSED
```

6. Once you have finished viewing the results of your test, press the **Enter** key to return to the Online Diagnostics menu.

```
Online Diagnostics
>Send data to port<
Perform loopback test on port
```

7. Press the **Esc** key to return to the main RIO configuration utility window ([page 277](#)) and then press the **Esc** key again to exit the utility.
8. If you have finished running port diagnostics you now need to re-enable the port you have tested. To do this, At the command prompt, type **/etc/spxadimport enable r00x** (when r00x is the port number for example, r001) and press the **Enter** key.

For more information about **spxadimport**, see [spxadimport utility for configuring ports](#) on page [225](#) in [Chapter 4 Quick Reference](#).

SCO UnixWare Error Messages

Message	Reason	Action required
FAILED: Timeout on read	Loopback connector, Link cable or power supply has been disconnected during the test. Loopback connector has not been fitted to the port.	1. Check that loopback connector, link cable and power supply are fitted. 2. If the above don't work then contact Technical Support. See Appendix D Contacting Perle .
FAILED: Write fail	RIO is unable to write to the port.	1. Contact Technical Support. See Appendix D Contacting Perle .
FAILED: Read fail	RIO is unable to read from the port.	
FAILED: Data read is different from data written	The data read from the port is different to that written to the port.	

Windows NT troubleshooting

This section contains information designed to help you solve any problems you may experience while installing or configuring your RIO system under Window NT. It includes the following;

- [General fault finding under Windows NT](#) on page [286](#)
- [Error Messages](#) on page [290](#)
- [Testing RIO host cards with the Hardware Diagnostics program](#) on page [297](#)

General fault finding under Windows NT

This section outlines some general problems you may encounter under Windows NT and some suggested actions;

- [Machine fails to boot](#) on page [286](#)
- [NT operating system fails while loading](#) on page [287](#)
- [RIO driver or another driver fails to boot](#) on page [287](#)
- [COM ports are not accessible](#) on page [288](#)
- [RIO NT driver is operating satisfactorily but then fails](#) on page [288](#)

Machine fails to boot

Symptom	Action required
Total boot failure (blank screen), or there is ROM boot but the machine hangs	<ol style="list-style-type: none"> 1. Turn off machine, remove RIO card(s) and reboot. 2. Ensure any RIO PCI cards are not using a resource required by another non-RIO card. 3. Ensure resources in the BIOS setup are not reserved for a non-RIO non-PCI card 4. In the BIOS setup, make sure memory addresses and interrupts are reserved for any ISA cards in use. 5. If required, change the configuration switches on any ISA cards to use available addresses. 6. Insert your host card in a different machine and use RIO Hardware Diagnostics Program to check if you have a faulty card.

NT operating system fails while loading

Symptom	Action required
System hangs or blue screen	<ol style="list-style-type: none"> 1. If a blue screen is displayed, note the five hexadecimal numbers at the top line of the screen. Otherwise go to step 2. of this procedure. 2. Reboot your machine. The system now displays this message: Press spacebar NOW to invoke Hardware Profile/Last Known Good Menu 3. Press the spacebar. The system now displays this message: To switch to the Last Known Good configuration, press 'L'. 4. Press the L key to switch to last known good configuration. 5. If your machine now boots properly, change the configuration settings of the RIO card to match those in the BIOS setup. See Installing an ISA host card on page 143 in Chapter 2 Installing hardware and software. 6. If your machine still fails to boot properly, check for resource conflicts or faulty hardware.

RIO driver or another driver fails to boot

Symptom	Action required
A window entitled Service Control Manager is displayed with the message: At least one service or driver failed during startup. Use Event Viewer to examine the event log for details.	<ol style="list-style-type: none"> 1. Check the Windows NT Event Viewer; you will see actions suggested to you. 2. Run Windows NT Diagnostics to find available IRQ and memory addresses. (You may need to reserve settings in the BIOS setup). 3. Alternatively, test the card with the RIO Hardware Diagnostics program. See Testing RIO host cards with the Hardware Diagnostics program on page 297.

COM ports are not accessible

Symptom	Action required
None	<ol style="list-style-type: none"> 1. Run the RIOCONF configuration utility. 2. If a picture of the RTA is shown with the host card; <ol style="list-style-type: none"> a. Check that the RTA is connected to the host card with a solid green line. b. If no line is displayed try power-cycling the RTA. Failing this, try re-booting the system. c. If the line has still not changed try re-installing the driver. d. Once a green line is displayed, configure the RTA to set the COM device names for the system. 3. If no picture of an RTA is shown with the host card; <ol style="list-style-type: none"> a. Check connection of RTA link cable. a. Check power to the RTA, and power cycle unit. b. Reinstall the driver.

RIO NT driver is operating satisfactorily but then fails

Symptom	Action required
blue screen black screen machine reboots: system hangs	1. Contact Technical Support. See Appendix D Contacting Perle

Error Messages

This section lists all error messages output by RIO. To see the error messages, go into the Windows NT Event Viewer, in the Windows NT Desktop. Each error message is explained and steps to overcome the problem are described. If these steps do not remedy the error, contact Technical Support, see [Appendix D Contacting Perle](#).

If you cannot find the error message here, it may have been produced by your operating system, or another hardware device installed on your system. Most problems can be resolved by selecting a different address/interrupt for the RIO card or by reinstalling the software.

Error messages are detailed in the following sections;

- [Messages which are common](#): on page [291](#)
- [Messages which are infrequent](#): on page [292](#)
- [Messages which you should rarely see](#): on page [293](#)

Messages which are common:

Message	Reason	Action required
No host cards found	Host card is not found	<ol style="list-style-type: none"> 1. Install card. 2. Alternatively, alter memory address/interrupt settings with RIOCONF.
Can't boot host card	Problem with host card	<ol style="list-style-type: none"> 1. Check card installation, 2. Alternatively, alter memory address/interrupt settings with RIOCONF.
Resource conflict detected	Possible host card clash	<ol style="list-style-type: none"> 3. Alter host card memory address and interrupt with RIOCONF
Host card physical address collision detected at %2 serial numbers are %3"	Host card clash	<ol style="list-style-type: none"> 4. Alter host card memory address and interrupt with RIOCONF

Messages which are infrequent:

Message	Reason	Action required
Couldn't find download code file	Download file missing, or registry entry wrong	1. Reinstall driver
Download code file too big	Internal Error	
Couldn't open driver key	RIO file/registry damaged	
Couldn't open host key		
Not enough config data		
Intercepted exception while reading host keys		
Bad status		
Rta Id not in valid range		
Rta Id already configured		
port not found		
No device object available for port		
Intercepted exception while scanning for host cards	Possible host card clash	1. Alter host card memory address and interrupt with RIOCONF
Intercepted exception while checking out host cards		
Couldn't connect to interrupt		
Couldn't create symbolic Link	Internal Error	1. Reinstall driver
Couldn't create devicemap entry	Possible clash with a current device name	1. Change to different com device name
Maximum number of host cards exceeded	Host card limit exceeded	1. Remove host card

Messages which you should rarely see:

Message	Reason	Action required
Failed to allocate buffer	Internal Error	1. Reinstall driver 2. Alternatively, contact technical support.
Couldn't find enough RTA download code names	Internal Error	
Couldn't map download code file	Download file missing, or registry entry wrong	
Overflowed enumerate buffer	Internal Error	
Too many addresses		
Too many interrupts		
Couldn't convert to Unicode		
Couldn't delete value entry %2		
Couldn't create port device		
Could not create Rio device		

Clashing memory address

Clashing memory addresses can occur on PCI and ISA bus machines.

PCI machines On PCI machines, clashes are possible when the memory address for an ISA card has not been reserved in the system. Use the PCI BIOS setup program to reserve ISA memory resources and ensure that the physical address of the ISA card matches this setting.

ISA machines On ISA machines, if you suspect that installation has failed due to a clashing memory address, switch off your machine, remove the card, reconfigure the settings using the RIO Configuration program, reset the rotary switches on the card, re-insert the card and reboot. You do not need to re-install the RIO software.

RIO Memory requirements The RIO host card requires a full, non-cached, 64K memory segment starting on a 64K boundary. The default address is **0D0000** but address space below a megabyte is usually tight.

The segments at **0C0000** and **0E0000** may be available, but if you have less than 16Mb of extended memory installed, we recommend that you install at a high address. You can use any non-cached 64Kb memory segment above extended memory (For example, **F00000**, **F10000**, or **F20000**).

If you are unable to find a free memory segment, you will have to reconfigure another device to make room for your RIO card.

Clashing Interrupts

Interrupt clashes can occur on both PCI and ISA machines.

On PCI machines, clashes are likely when the interrupt level for an ISA board has not been reserved in the system. Use the PCI BIOS setup program to reserve the ISA interrupt level that will be used by the card, or select polled mode operation.

(RIO Host ISA can use interrupts 9,11,12 or 15.)

On ISA machines, you will have to reconfigure the RIO software and select a new interrupt, or polled mode. RIO HOST ISA cards can use interrupt 9, 11, 12 or 15.

System Information

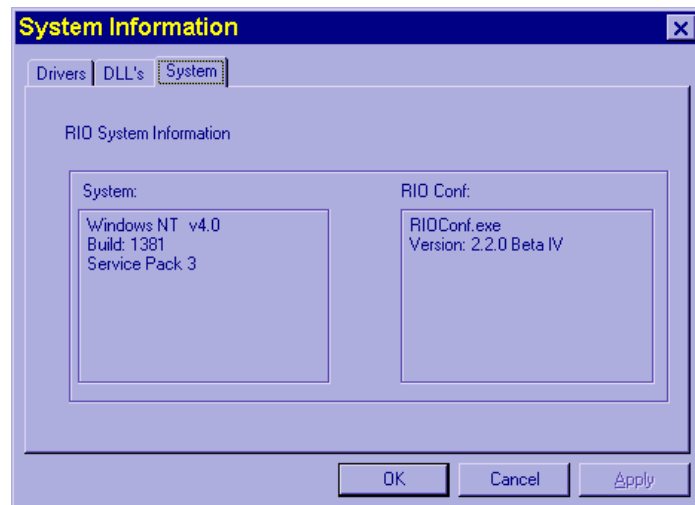
To obtain information about your system, including the drivers and DLLs in use proceed as follows;

1. In the Windows desktop, display the Perle program group window.
2. In the Perle program group window, double click on the RIO icon.

The RIO Configuration window is now displayed.

3. In the RIO Configuration menu, click on **Help > System**

The System Information tabbed window is now displayed.



4. In the System Information tabbed window click one of the following tabs to display the information you require.

System Information	Click on this tab
General	System
DLL information	Dll's
Driver information	Drivers

5. When you have completed viewing, in the System Information window, click on the **OK** button to close the window.

Testing RIO host cards with the Hardware Diagnostics program

RIO includes a Hardware Diagnostics program which allows you to pinpoint and diagnose faults with your RIO host card(s). The Hardware Diagnostics program is included on the CDROM included with your RIO system. It consists of a stand-alone command line utility that you run from the DOS prompt.

This section includes the following;

- [How to run a test using RIO Hardware Diagnostics on page 298](#)
- [Test options guide](#) on page [300](#)
- [Additional options](#) on page [302](#)

How to run a test using RIO Hardware Diagnostics

To test the host cards on your system using the RIO Hardware Diagnostics program, proceed as follows;

1. Ensure your RIO host cards are installed and configured correctly before running these tests. See [Installing a PCI host card](#) on page 142 and [Installing an ISA host card](#) on page 143 in [Chapter 2 Installing hardware and software](#).

Note

You can install up to a maximum of four host cards in the test machine. The cards can be a mixture of types.

2. On each host card under test, loopback the ports on the host card by linking ports 1 and 2 using a RIO link cable and do the same for ports 3 and 4.
3. Copy the RIO diagnostics program **riodiags.exe** from the CDROM to a DOS bootable disk. You can find the diagnostics program under:
rio/diags/hostdiag/riodiags.exe

Note

You must use DOS 3.1 or above to run the diagnostics program.

4. Boot your system using the disk you have made.
You can use the diagnostics program to run the type of test you require.

5. At the Dos prompt, type **riodiags** <options> and press the **Enter** key.
Where <options> are the commands needed to the different types of test available.
The general types of tests available are shown in the next table. For details of commands, see [Test options guide](#) on page 300 and [Additional options](#) on page 302.

Type of test	To run this type of test..
Individual tests	At the dos prompt, type riodiags followed by the test option you require. For example, riodiags -cpu :
Multiple tests	At the dos prompt, type riodiags followed by the test names on the same command line separated by spaces, for example, riodiags -cpu -prom -config
Running tests on multiple host cards	<p>At the dos prompt, type riodiags -board <board number>, <board number>, etc. up to the maximum of four cards. If one of the cards is an ISA card, add the string -isa <address> after riodiags</p> <p>For example, riodiags -board 0,1,2 cpu and riodiags -isa 0xd0000 -board 0,1,2 -cpu</p> <p>Specify the test name in either upper or lower case; the test identifier can be either '-' or '/'.</p>

The complete suite of tests will commence.

6. Should any of the other tests indicate a failure, check your host card's physical address or interrupt are not clashing with other devices/memory. Do this by using the **-installed** information query (see [Additional options](#) on page 302). Try a different interrupt and/or memory address for the RIO card.

Note

In the event of a test failure the programme will not execute the remainder of the tests. If you can, clear the problem on the failed test and re-run the tests.

7. Upon completion of the tests, press the **Esc** key to return to the DOS prompt.

Note

If all the tests pass, the programme will complete and return you to the DOS prompt.

Test options guide

A summary of the tests available using the Diagnostics utility is given in the next table

Test	To run this type of test, at the dos prompt, type....	Description
RAM test	riodiags -ram <type> Where <type> can be any combination of arb, host or trans. If more than one test is required then use a comma (,) to separate each test. For example, riodiags -ram arb,host performs both the Arbitration Test and the Host Memory Test. If no type is specified, all ram tests are performed by default.	Validates BYTE and WORD accesses and address lines when the host machine reads and writes data patterns to the RIO host card memory.
Arbitration Test	riodiags -ram <arb> Where <type> can be any combination of arb, host or trans. If more than one test is required then use a comma (,) to separate each test. For example, riodiags -ram arb,host performs both the Arbitration Test and the Host Memory Test. If no type is specified, all ram tests are performed by default.	Checks that the host machine and the RIO host card CPU can concurrently access the RAM on the host card using the cards arbitration logic.
Frequency test	riodiags -freq	In this test host machine times the transputer on the host card to check the host card is running at an approved frequency. Note that some transputer run at both 20MHz and 25MHz; both speeds are correct.

Test	To run this type of test, at the dos prompt, type....	Description
Links test	riodiags -link	<p>This test checks that the RIO host card can send and receive data on all its Transputer links via an external cable. To perform the test:</p> <ol style="list-style-type: none"> 1. On each host card under test, loopback the ports on the host card by linking ports 1 and 2 using a RIO link cable and do the same for ports 3 and 4. 2. If have only one cable, run the test on ports 1 and 2, then swap the cable over to ports 3 and 4 and repeat the test.
CPU test	riodiags -cpu	<p>This test checks that the RIO host card CPU is capable of running code from its external ram and that a reset to the card shall cause the CPU to be reset. It checks also that the Configuration Prom can also be accessed from the Transputer bus.</p>
Interrupt test	<p>riodiags -intr <level> When <level> defines the interrupt level you want to test.</p> <p>If the Interrupt test fails with the message 'Multiple or spurious interrupts', you are likely to have an interrupt clash. Re-run the test specifying a different level.</p> <p>You can only run the Interrupt test by specifying it. It does not run during the automatic complete run of tests.</p>	<p>Allows you to specify particular Interrupt levels when running a test, rather than use all levels which can cause problems on some systems.</p>
Config prom test	riodiags -prom	<p>In this test the host machine reads and verifies the host card configuration prom.</p>

Additional options

The RIO Diagnostics utility allows you to add other control and information display commands to your command line instructions. The available options are detailed in the next table

Option	Description
-soak	This option causes all the selected tests to be repeated continuously until the program is interrupted by your pressing CTRL+BREAK, or an error is detected.
-cont	This option causes the application to continue if possible after an error has been detected. The default mode of operation is for the diagnostics to stop execution as soon as an error is detected.
-board <number>	If more than one host card is installed in the machine you can use this option to indicate which host card to perform the tests on. Valid <numbers> are 0, 1, 2 and 3.
-isa <addr>	This option allows the user to specify the address(es) of RIO ISA cards installed in the system. Addresses are given in the format '0xc0000,0xd0000,0xe0000,0xf0000'. If no addresses are specified the application shall search through valid addresses looking for AT host cards.
-testarea	Host cards can only be tested if they are mapped in memory address space below 256 Mbytes. If cards are mapped in outside this range, the diagnostics will detect this and exit with a warning. If the '-testarea' option is specified this instructs the diagnostics to test the host cards above 256Mbytes.
-help, -h	This option overrides all other options and displays a help message documenting the function of the diagnostics and displaying the command line options.
-version	Displays RIO Diagnostics version information.
-info	This option generates the display of configuration prom information from the host card(s) under test.
-installed	This option displays a list of host cards installed in the system (Max. 4 cards), their physical addresses, slots and so on.
-config	Performs the PCI configuration space test.

Appendix D Contacting Perle

You need to read this appendix if you want to...

You need to read this appendix if you want to contact Perle for technical support or any other queries about this product.

This appendix includes the following sections;

- [Making a technical support query](#) on page **304**
- [Repair procedure](#) on page **307**
- [Feedback about this manual](#) on page **308**
- [Contacting Perle technical support](#) on page **309**

Internet access

[Click here to access the our website at the following URL:](#)
<http://www.perle.com>

Email

[Click here to email](#) Perle at the following address;
Email: ptac@perle.com

Making a technical support query

This section contains the following information about making a query;

- [Who to contact](#) on page [304](#)
- [Information needed when making a query](#) on page [305](#)
- [Making a support query via the Perle web page](#) on page [306](#)

Who to contact

If you bought your product from a registered Perle supplier, you must contact their Technical Support department; they are qualified to deal with your problem.

If you are a registered Perle supplier, and bought your product from Perle, contact Perle Technical Support using the details given in [Contacting Perle technical support](#) on page [309](#).

Information needed when making a query

When you make a technical support enquiry please have the following information ready;

Hint

Print out this page and fill in the table provided with the basic information you need.

Item	Write details here
Product name and version	
Problem description	
Operating system version	
Driver version	
Details of any other cards installed in your system	
Your name	
Company Name	
Country	
Phone number	
Fax number	
Email address (if available)	

Making a support query via the Perle web page

If you have an internet connection, please send details of your problem to Technical Support using the email links provided on the Perle web site in the 'Support' area.

See also [Contacting Perle technical support](#) on page 309 for email links and other contact details for the Perle technical support centres.

[Click here to access our website at the following URL:
http://www.perle.com](http://www.perle.com)

Repair procedure

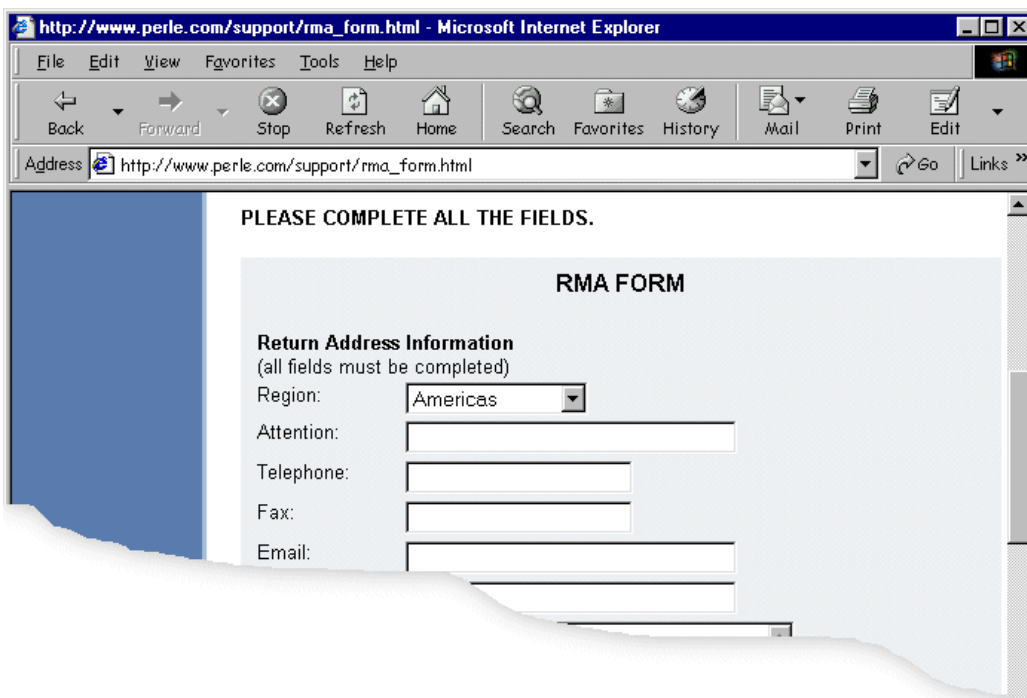
Before sending a unit for repair, you must contact your Perle supplier. If, however, you bought your product directly from Perle you can contact directly. See [Contacting Perle technical support](#) on page 309 for contact information.

Customers who are in Europe, Africa or Middle East can submit repair details via a website form shown in the next picture. This form is on the Perle website, www.perle.com, in the **Support** area.

Click here to access our web site at the following URL:
http://www.perle.com/support/rma_form.html

In the USA and Asia contact the office shown in the Technical Support section.

Website RMA (Return Material Authorisation) Form



The screenshot shows a Microsoft Internet Explorer browser window displaying the RMA Form at the URL http://www.perle.com/support/rma_form.html. The browser's address bar and menu bar are visible. The form itself is titled "RMA FORM" and includes a heading "Return Address Information (all fields must be completed)". The form contains several input fields: a dropdown menu for "Region" (currently set to "Americas"), and text boxes for "Attention:", "Telephone:", "Fax:", and "Email:". The form is set against a light blue background with a darker blue sidebar on the left.

Feedback about this manual

If you have any comments or suggestions for improving this manual please email Perle using the following address;

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